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JULY 1981 NUMBER 155

Monthly Report on the Uranium Market

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EXECUTIVE SUMMARY & INDUSTRY OVERVIEW
NUEXCO REPORT 155

The **Exchange Value** decreased 75 cents to $24.25 per pound U_3O_8. The large quantities of material available at $25.00 over the past few months in most cases have either been removed from the market or have been reoffered at prices below $25.00 in order to stimulate buyer interest. Two sales of significant quantities to utilities are reported this month at prices close to current Exchange Value.

Active inquiries to sell in the spot and near term market declined almost two million pounds to a total of 5.2 million pounds U_3O_8 or its equivalent. The ratio of inventory holders to primary producers as sellers remained fairly evenly split. Close to half of the available material is in the form of UF_6 which must either be swapped or deconverted in order to respond to requests for U_3O_8. Total of inquiries to purchase in the spot and near term market decreased to about one million pounds. However, a larger number of utilities are represented in the active buyer category.

The **Transaction Value** decreased $1.20 to $24.50 per pound U_3O_8. The higher priced transactions from the end of 1980 have been replaced by recent transactions priced at about current Exchange Value. There are four uranium transactions reported this month, including one loan. The total of material involved approximately 1.5 million pounds. The **Loan Use Charge Rate** decreased to 5-1/2 percent. Activity in the loan market increased and is being discussed at about this level.

The secondary market for conversion services has been quiet this month since demand has been primarily in the intermediate term (one to five years). The **Conversion Value** remained at $1.15 per pound U as UF_6 for the second month. There are several offers outstanding on the spot and near term markets to sell conversion at this price level.

The future of France's nuclear power program in light of the recent election results is discussed in this month's *Commentary*. This month's *Topical Essay* begins a series of discussions on unconventional types of transactions with a look at inventory upgrading.

A reevaluation of reasonably assured resources (RAR) of the Free World is presented and commented upon in this month's *Raw Materials* essay.

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MONTHLY REPORT ON THE URANIUM MARKET
July 1981 No. 155

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URANIUM MARKET

GENERAL

The out-of-court settlement between Westinghouse Electric Corp. and Phibro Corp. marks the end of a unique phase in the short commercial history of the uranium market. The Westinghouse cases were the centerpiece of this unusual drama stretching almost six years. It is interesting to note that the price of uranium in current dollars, as measured by Nuexco's Exchange Value, was essentially the same in June 1981 ($25/lb. U_3O_8) as it was in September 1975 ($26/lb. U_3O_8) when the Westinghouse cases began.

With perfect hindsight it is now possible to see that the procurement activity that drove up prices in late 1975 and 1976 was, for the most part, unnecessary because forecast consumption levels failed to materalize. The price rise consequently motivated new exploration development and accelerated production decisions which helped lead to the present excess supply condition. This condition has been further aggravated as reactor cancellations and delays continue to reduce uranium requirements.

Commodity experts unfamiliar with uranium react with disbelief when told that the uranium market was simultaneously characterized by rising prices, increasing supply *and* falling demand. The explanation of the apparent paradox is four fold: uranium is a single use commodity; long lead times are associated both with uranium development and its end use in reactors; utility companies, the only consumers of uranium, are characterized by an unusually conservative nature; and finally, forecasts of uranium requirements have tended to be very optimistic.

Barring some now-unforeseen event that alters buyer perceptions, the current and projected imbalance between production and consumption suggests that a near-term price rebound is unlikely. Producer competition for limited sales opportunities has already impacted on marginal operations worldwide. The shake-out will likely continue for some time.

The experience of the past several years does suggest certain aspects for the future. first, any concerns about adequate uranium supplies have been erased. Exploration inspired by the dramatic price rise resulted in the identification of uranium resources capable of supporting almost any realistically conceivable level of nuclear power growth well into the next century. Second, it is clear that both buyers and sellers have gained in sophistication, and thus the market itself is more likely to behave in an increasingly rational and predictable manner. These two factors in turn define a more perfect market than has previously existed, which will likely produce a price ceiling associated with the marginal cost required to fill the last pound of demand.

AUSTRALIA

The previously reported sale (Nuexco Report 146) of 3.15 million pounds U_3O_8 from Energy Resources of Australia (ERA) to Synatom of Belgium has been approved by the Australian government. The sale is contingent upon the Australian safeguards agreements with Euratom coming into force. ERA has now sold enough uranium to cover the first ten years of its projected annual production of 6.6 million pounds U_3O_8.

The Australian government's uranium pricing policy involving a floor price established some time ago, is viewed by some in Australia as unrealistic in light of the current depressed uranium market. However it still appears likely that the Australian government, while conscious of substantial price falls since the floor price was established, will try to maintain at least its concept. In any event, it may be prepared to modify its application by encouraging "creative" interpretation of the policy on the part of sellers.

The extent to which such creative interpretation actually materializes remains to be seen. But the Australian government faces a difficult balancing act in deciding what is better in the national interest, the strict maintenance of an arbitrary floor price or the deferment of new uranium developments. In the case of a large producer, such as Jabiluka, strict construction of the pricing policy in the light of competing production, especially from Canada, could lead to substantial deferral of the project due to lost sales. The Australian government will face similar policy challenges if additional sales opportunities arise for the existing producers, such as ERA or Queensland Mines and Mary Kathleen.

Thus the Australian government appears to be at a crossroads of either changing its policy to adapt to the new market; or to retain the policy on its face, perhaps with some interpretive latitude. It appears most likely at this time that the government will adopt the latter approach. Politicians generally prefer

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to avoid risk, and it would seem that omission to act officially would, in this instance, not incur as heavy a political risk as a highly visible change in the floor price policy.

CANADA

At least three contracts have been completed for the sale of Saskatchewan uranium production to US and European utility buyers. The agreements have been signed and are awaiting the necessary approvals by the Canadian government. The approval process is expected to require about sixty days, after which purchase announcements will likely be forthcoming from the respective buyers.

The finalization of these contracts is very significant in at least two respects. First, they represent the first truly arms-length sales of production from the new deposits in Western Canada. The production previously committed was based on equity participation in the projects, or at least has the flavor of government-to-government deals. These latest sales are truly commercial and represent a breakthrough.

Even more significant is the fact that at least one of the buyers is US. Other US buyers are also negotiating for the long term supply of U_3O_8 from Western Canada, and additional contracts will likely be forthcoming this year. It now appears that a substantial portion of new uranium contracts signed by US buyers in 1981 will be with Canadian sellers.

EUROPE

According to data recently published in the USSR, nuclear power accounted for 5.4 percent of Soviet electric energy production in 1980. Current plans call for this to increase to between 14 and 14.8 percent by 1985. By the year 2000, the USSR plans to obtain about 60 percent of its electric energy from nuclear power. The other members of the Council for Mutual Economic Assistance (CMEA)—Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary, Poland and Romania—anticipate similar expansion of nuclear capacity. The Soviets have controlled capital costs of nuclear plants with standardization of reactor units and modular construction.

The USSR and the other COMECON countries have not yet participated in the commercial uranium market in the West. However the ambitious nuclear development plans might begin to tax COMECON's domestic uranium resources. Thus uranium purchases by the Soviet Bloc nations might be expected eventually, especially in view of the depressed state of the uranium market.

Italy plans to announce a revised program for nuclear generating capacity within a few weeks. The new plan is expected to call for 6,000 MWe of additional nuclear capacity to be on line by 1992, including Montalto units 1 and 2, which are currently under construction. The cognizant regional and local governments have indicated that the proposed nuclear station sites are acceptable in principle, subject to negotiating appropriate compensation to the affected communities.

FAR EAST

Construction of a pilot plant in Japan to recover uranium from sea water will begin in July 1981 and represents the culmination of five years of basic research and development. Located in Kagawa Prefecture, near Nio City, the plant is scheduled for operation in 1984. Responsibility for the design and construction of the plant rests with the Japan Metals and Mining Agency with funding provided by the Ministry of International Trade and Industry (MITI).

The plant's total cost is estimated at about $10 million but annual production is anticipated to be only about 25 pounds of U_3O_8. Obviously such economics indicate a continuing research and development effort. The stated long term goal is a full scale plant capable of producing two million pounds annually in the post 2000 period. Full scale costs of Japan's proprietary sea water process are estimated in the range of $160 to $340 per pound U_3O_8.

Tokyo Uranium Development Company (owned by: Marubeni 57.5 percent, Nippon Mining 30 percent, Fuji Bank five percent, Industrial Bank of Japan five percent and Yasuda Insurance 2.5 percent) announced a resumption, with French cooperation, of uranium exploration in Maritania. A similar effort in that country was halted in 1975 by political turmoil. The new program is modest and will involve Japanese expenditure of only about $650,000 over the next three years. Even if successful, production is not contemplated until after 1990.

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By US standards, neither of these developments would probably pass a risk-benefit analysis. However, Japan's decision to move forward is another manifestation of that country's concern about security and diversity of long term raw materials supply.

Following a well-publicized request for proposals, The Philippines' National Power Corporation (NAPOCOR) is close to completing a purchase of 622,000 pounds US origin U_3O_8 from a trader who packaged offers from several US producers.

The material, which is to be delivered to the US Department of Energy (DOE) in May 1982 for enrichment, represents the first core of NAPOCOR's 620 MWe PNPP unit 1 located on Luzon's Bataan peninsula. The unit is about 25 percent complete and is currently scheduled for commercial operation in January 1985.

At this point, NAPOCOR has not made arrangements for its ongoing uranium needs of about 200,000 pounds U_3O_8 annually beginning in 1986. During the past five years there have been recurring announcements that Australia would provide NAPOCOR's long-term supply. Prior to that, Gabon was mentioned as the long-term supplier. However, in each case these were very general government to government statements with political and diplomatic overtones, but without apparent commercial substance.

The timing and nature of the first core purchase suggests increased market sophistication and price sensitivity. It would not be surprising, therefore, if NAPOCOR elected to bide its time and observe marketplace developments, before making further commitments.

UNITED STATES

At least one US uranium producer has officially tabled a proposal[1] to allow USDOE enrichment customers to select the transactional tails assay under requirements type contracts. This option already exists under adjustable fixed commitment type contracts, within certain limits. The proposal outlined several advantages for the uranium industry, as well as for the utilities. Since the proposal could apparently be implemented by administrative action within DOE, it is worthwhile to paraphase the arguments for extending such an option.

If DOE can provide customers holding requirements type contracts an option to select the transactional tails assay, the uranium inventories held by utilities could be utilized faster. A smaller amount of inventory would be expected to be liquidated in the marketplace to compete with material from primary producers.

Many DOE customers with adjustable fixed commitment contracts generally have an unwanted situation of excess uranium inventories and excess SWU's under contract. Thus, with a variable tails option, they must decide on whether to select a high tails assay to consume excess uranium or a low tails assay to consume excess SWU's. This choice is not present for customers with requirements contracts since excess SWU's, by definition, do not accumulate.

Having the opportunity, a customer could select the most economically advantageous tails assay for producing enriched uranium giving consideration to the relative costs for enrichment services and feed uranium. Because of the high level of uranium inventory held by both US and non-US utilities, and because of the relatively low spot market prices for uranium, it would appear that many of DOE's customers would like to use a higher transactional tails assay. If the investment in excess uranium is considered a *sunk* cost, the lowest *forward cost* of producing enriched uranium would probably involve the election of a high tails assay.

The requirements contract, in current form, only permits the use of DOE's standard transactional tails assay which is presently set at 0.20 percent U-235. There is an optimum tails assay which will minimize the overall cost of the enriched uranium needed to fabricate nuclear fuel. The optimum tails assay is dependent upon the relative costs for feed uranium and enrichment services, and is currently about 0.28 percent U-235. (See Statistical Data Section of this Report.) If a DOE enrichment customer were to select 0.28 percent instead of using the standard 0.20 percent to obtain enriched uranium, about 15 percent more uranium feed would be utilized, and the overal cost for the enriched uranium would be reduced.

As one of the provisions which would permit a customer to select the transactional tails assay, DOE could impose an appropriate surcharge upon cus-

[1]Letter from J.D. Young, Sohio Western Mining Co. to Senator Peter V. Domenici, April 2, 1981.

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tomers who transact at the standard assay from any adverse cost impacts caused by other customers selecting a non-standard transactional assay. The concept of a surcharge has already been introduced by DOE as a provision for a customer to select the transactional tails assay under the adjustable fixed commitment type contract.

Uranium producers in the US continue to respond to the current market situation with announcements of cutbacks and shutdowns. The growing awareness of rising uranium inventories, pessimistic forecasts of demand and the expectation that little real increase in the price of uranium is likely in the short term have forced many US producers to recognize that uncommitted production will have to be produced at a relatively low cost if it is to be sold profitably in the near term. This subject has been the focus of much attention in the US for many months and has been covered extensively in past Nuexco Reports.

Nuexco last published a forecast of US uranium production in Report 147. The forecast was subsequently revised for the years 1981 and 1982 to reflect the fact that it had underestimated the time inertia inherent in uranium production, especially among conventional operations and, to a further degree,

Table 1

SUMMARY OF MAJOR US URANIUM PRODUCTION CUTBACKS ANNOUNCED SINCE MARCH, 1981

Date	Company	Event
3/81	Wyoming Mineral Corp.	Will close Iragary, Wyo. in-situ mining project indefinitely.
3/81	Cotter Corp.	Suspending development of JD7 mine in Colorado.
3/81	Pathfinder Mines Corp.	Laid off another 30 employees at Shirley Basin, Wyo.
4/81	Cleveland Cliffs Iron Co.	Delayed any significant steps in the construction of a commercial mine or mill at Pumpkin Buttes, Wyo.
4/81	Exxon Nuclear Corp.	Cut back Highland production by one-third. Open pit operations cut to working at half rate with underground mine to be phased out by early 1982.
4/81	Pioneer Uravan, Inc.	Closing four of five small Colorado Plateau mines; announced going ahead with 1,000 ton per day mill near Slick Rock, Colorado.
4/81	Homestake Mining Co.	Indefinitely delaying construction of 600 ton per day mill in Colorado. Will be phasing down open pit operations there from three to one shift per day.
4/81	United Nuclear Corp.	Sold its 70 percent share of Church Rock mine and mill to its partner, Homestake Mining Co.
5/81	Sohio Western Mining Co.	Closed Seboyeta, New Mexico mill.
6/81	Sohio Western Mining Co.	Announced closing of Seboyeta mine.
6/81	Western Nuclear, Inc.	Will reduce output at Split Rock to 30,000 pounds annually. U_3O_8 is to be recovered from mine discharge water.
6/81	Plateau Resources Corp.	Stopped construction of Shootering Canyon mill in Utah, but mine development continuing.
6/81	Wyoming Mineral Corp.	Placed all Wyoming mines on standby.

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among open pit operations. Table 1 of Report 152 published a summary of major US uranium cutbacks announced since August, 1980. A summary of US production cutbacks and deferrals announced since March, 1981 are presented in Table 1 of this Report.

Most of the cutback announcements made since the publication of Report 147 and listed both in Table 1 of this Report, and in Table 1 of Report 152 were already taken into account in the Nuexco forecast of US uranium production. This is because most of the announced cutbacks had already been predicted, either on the basis of proprietary knowledge that the change would be made, or by deduction based on other information, such as cost of production, regulatory climate, technical problems, etc. A revised Nuexco forecast at present and the conclusions from such a forecast, would not differ significantly from the forecast of Report 147.

According to data available from DOE, US uranium production from January 1, 1981 through May 31, 1981 amounted to approximately 16 million pounds U_3O_8 (equivalent to an annual rate of 38.4 million pounds). However much of this production came from the running of ore stockpiles through the mills. Thus even in cases where mine cutbacks or shutdowns have already occurred, some mills have continued to operate at high capacity, underscoring again the inherent inertia of conventional mining operations.

The Donaldsonville plant of Freeport Uranium Recovery Corp. was declared commercial as of July 1, 1981. The first U_3O_8 was produced at Donaldsonville on May 21, 1981, and startup was smoother than anticipated. The nominal output of the plant is 420,000 pounds U_3O_8 annually.

TRANSACTIONS

There are four uranium transactions reported this month. One transaction was concluded between a US producer and a US utility for between 300 thousand and 600 thousand pounds U_3O_8, with deliveries stretching over the next ten years. The price is based on market price at the time of delivery. A loan transaction took place from a US utility to a US producer for between 100 thousand and 300 thousand pounds U_3O_8. The loan was made this year, and the material is to be returned by 1986.

A US utility purchased between 300 thousand and 600 thousand pounds U_3O_8 from another US utility. Delivery will take place this year. Finally, a US utility purchased between 300 thousand and 600 thousand pounds U_3O_8 from a US producer, with delivery occurring this year.

PRICING

The **Exchange Value** as of June 30, 1981 is $24.25 per pound U_3O_8, a decline of 75 cents from last month. The market this month was marked by transactions of sizable blocks of U_3O_8 at prices less than $25. In addition, utilities have appeared in the spot and near term markets as active buyers. Two sales of significant quantities to utilities are reported this month at prices close to current Exchange Value. There are fewer sellers in the market, and they are split fairly evenly between producers and inventory holders.

There is some indication that the uranium market is entering a two-tiered phase similar to a divergence which occurred during 1979. (At that time, some buyers were willing to pay a premium for "stringless" uranium.) Now, due to the erratic entrances and exits of major blocks of spot U_3O_8 in the market, a split may be developing between the longer term and spot/near term market. The long term market, which has not seen any major participation by inventory holders, seems to have firmed up at prices above the current Exchange Value. The spot and near term markets are active at the current level for significant quantities as the absorption of excess inventory material, which has been a major market factor for several years occurs in the marketplace. Thus spot and near term material could be bought for on the order of $24.25 or perhaps even less for small quantities. However longer term purchases from primary producers are apparently only available at higher prices at this time.

Material available for near term delivery as presented in the *Market Opportunities* section totals 5.2 million pounds U_3O_8 or its equivalent. Close to half of the available material is in the form of UF_6 which must be either swapped or deconverted in order to respond to requests for U_3O_8. Inquiries to purchase U_3O_8 in the same period totals one million pounds.

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There has been an increase in material offered for loan in both the near term and longer term as inventory holders look to alternate ways of inventory utilization. The **Loan Use Charge Rate** decreased this month to 5-1/2 percent as a substantial amount of material was offered for loan at about that rate.

The **Transaction Value** decreased $1.20 to $24.50 per pound U_3O_8 as of June 30, 1981. The higher priced transactions from the end of 1980 have been replaced by recent transactions of about current Exchange Value. There were ten qualifying transactions involving 2.9 million pounds U_3O_8.

CONVERSION

The **Conversion Value** remained at $1.15 per pound U as UF_6 for the second month. There are several offers outstanding on the spot and near term markets to sell conversion at this price level. The offers come from holders of uranium inventory in the form of UF_6 wishing to *deconvert* their material in order to respond to inquiries to purchase uranium in the form of concentrates. The fact that there are several inventory sellers in this position, and very little spot/near term demand for conversion services has resulted in the Conversion Value being driven down to this level.

There is some demand in the market for conversion services in the intermediate term (one to five years). However inventory holders are not normally interested in supplying this time frame, and as a result, conversion prices being discussed on the secondary market in this time frame are not as low as prices of transactions on the spot/near term. Normally secondary market sellers in the intermediate term are interested in assigning or subcontracting excess conversion previousiy ordered from the primary converters, as opposed to deconverting inventory in order to sell concentrates.

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TOPICAL ESSAY

UNCONVENTIONAL TRANSACTIONS: PART I, INVENTORY UPGRADING

The fluctuating uranium price and inventory situation over the past several years have given rise to a variety of unusual transactions and methods of inventory handling. The outright sale of inventory by utilities is just one method used to decrease the amount of money and the time that money is tied up. Another mechanism used to accomplish these objectives would be an inventory upgrading transaction. In this type of transaction, inventory in the form of U_3O_8 or UF_6 is "upgraded" to an equivalent value, and therefore smaller quantity, of enriched material.

Currently there are a number of utilities holding U_3O_8 or natural UF_6 inventories equal to several years consumption. An exchange of that natural uranium inventory for enriched product of the same value would speed up consumption. This would be equivalent to selling part of the U_3O_8 and using the proceeds to buy Separate Work Units (SWU) for enriching the remaining U_3O_8. Since less U_3O_8 would remain, the excess inventory would be consumed in a shorter time. This transaction can also be viewed as selling excess U_3O_8 to generate cash for SWU and conversion payments, instead of paying for these services out of the utility's cash account.

Tables 2 and 3 illustrate this concept. Table 2 shows a utility carrying five years natural uranium inventory. The utility's goal is to carry only a one

Table 2

UTILITY INVENTORY POSITION BEFORE INVENTORY UPGRADING

	Natural UF_6 Inventory			SWU Inventory		Total	Excess Annual
Year	Total Metric Tons U	Excess Metric Tons U	Excess Value ($ millions)	Total Metric Tons SWU	Excess Value ($ millions)	Excess Value ($ millions)	Carrying Cost @ 15% ($ millions)
1	1,000	800	54.4	—	—	54.4	8.2
2	800	600	40.8	—	—	40.8	6.1
3	600	400	27.2	—	—	27.2	4.1
4	400	200	13.6	—	—	13.6	2.0
5	200	—	—	—	—	—	—
							20.4

Table 3

UTILITY INVENTORY POSITION AFTER INVENTORY UPGRADING

	Equivalent Natural UF_6 Inventory			SWU Inventory		Total	Excess Annual
Year	Total Metric Tons U	Excess Metric Tons U	Excess Value ($ millions)	Total Metric Tons SWU	Excess Value ($ millions)	Excess Value ($ millions)	Carrying Cost @ 15% ($ millions)
1	522	322	21.9	325	32.5	54.4	8.2
2	322	122	8.3	200	20.0	28.3	4.3
3	200	—	—	75	7.5	7.5	1.1
4	200	—	—	—	—	—	—
5	200	—	—	—	—	—	—
							13.6

Assumptions

1. This is a utility with excess UF_6 or U_3O_8 inventory, but with no normal SWU inventory.
2. Annual consumption of natural UF_6 is 200 MTU; goal is to carry one year inventory.
3. Annual consumption of SWU is 125 MTS for 3.0 percent product and 0.2 percent tails; goal is to carry no inventory (buy on current basis only)
4. Each kg U costs $68; each kg SWU costs $100.
5. Owner is able to defer or cancel SWU which he otherwise would have purchased in each year.

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TOPICAL ESSAY

year inventory. The total excess annual carrying charges are $20.4 million. Table 3 shows the effect of upgrading the natural feed into the same market value of three percent enriched product. In year one, the excess value is still $54.4 million. However, it now takes only a little over two years to reach the desired inventory levels instead of four years, so the total excess annual carrying charges are $13.6 million.

To be eligible for an upgrading transaction, a utility will ideally have the following two characteristics:

1. a long natural uranium inventory position, and
2. a short SWU position during the time period in which it will burn the SWU obtained from upgrading.

However, there are very few utilities which meet these criteria. Therefore, the utility must be able to create a short position by cancelling, deferring, or assigning SWU to another party.

As far as the actual mechanism by which the upgrading is achieved, the simplest method is for the upgrading party to sell part of its U_3O_8 and use the money to enrich the remaining U_3O_8. However, many utilities have encountered problems which have prohibited them from either selling excess U_3O_8 to procure SWU, or even simply reducing inventory. Obviously, the utility with excess inventory could save additional carrying costs by selling the excess inventory rather than upgrading it. The following are specific reasons why utilities have not chosen or been able to directly sell inventory.

Economic reasons. There may be too little financial incentive, or there even may be a disincentive, to sell excess inventory.

1. The holder may not want to realize capital gains (or losses), or other consequences resulting from the sale.
2. A sale may reduce rate base earnings or Allowance for Funds Used During Construction (AFC) "earnings", if excess inventory has been allowed in the rate base or construction work in progress base.
3. The holder might be concerned that the subsequent replacement of the inventory could be at a much higher market price, or replacement might otherwise be difficult, and this would threaten its security of supply.
4. The inventory may be pledged to support the utility's bonds, or it may be owned by a leasing company.

Institutional reasons

1. A sale could draw unwanted attention to the situation of excess inventory by the management, the Public Service Commission (PSC), or the press.
2. The reduction of carrying charges might not be a high priority; the utility may simply be comfortable with its position or have more pressing problems elsewhere.

Philosophical reasons

Sales of uranium could put downward pressure on the uranium market. Some utilities might consider this to be unfavorable at the current time. A mechanism which might mitigate these concerns is a material trade. In this type of arrangement, the upgrading party would deliver its U_3O_8 to another party, who would in turn replace it with an equal market value of enriched product. This replacement could come from inventory, so that the delivering party would receive both the feed component of its enriched material plus either more U_3O_8 or cash to pay for the SWU.

It may be difficult to find this type of barter partner. It is more likely that an intermediary trading firm would do a back-to-back transaction and thereby become the barter partner for the upgrading party. The intermediary would take the upgrading party's U_3O_8, sell a portion on the spot market to raise cash, and use the cash to purchase conversion and enrichment services for the remaining U_3O_8 feed. This barter upgrading mechanism may offer some advantages to offset the concerns utilities have with selling inventory.

From an economic standpoint, the upgrading transaction would have the following advantages:

1. Upgrading might avoid the capital gains tax if it were viewed as an exchange of like assets.
2. Initially, it would not reduce rate base earnings or AFC earnings, since the same inventory value is in the rate base during the first year. Later, however, inventory would be removed from the rate base at a faster rate.
3. Only part of the excess natural uranium is being "sold", so the fear of high cost replacement/security of supply might be mitigated.
4. Even if the inventory is pledged, or on lease, upgrading would leave it initially with about the same market value, so the exchange should be equally acceptable to creditors and lessors.

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TOPICAL ESSAY

5. Upgrading in today's market takes advantage of price trends in both U_3O_8 and SWU. The upgrading party would reduce its inventory of U_3O_8 where the market price trend is declining, and increase its inventory of SWU, where the market price trend is increasing.

6. Another factor which could make upgrading financially attractive is the current availability of enrichment services at spot prices discounted from the DOE price.

From an institutional standpoint, the following advantages might accrue:

1. Upgrading might receive less attention than an outright sale. In fact, upgrading could be presented in a positive light to management and the PSC as a way of optimizing inventory, not liquidating it.

2. Although inventory management might not receive high priority from the fuel department today, a savings of several million dollars to the treasury department can be demonstrated for many utilities. This might provide the necessary motivation for such an opportunity to receive attention.

The unstable market conditions of recent times have led to complex and creative transactions and inventory management policies such as inventory upgrading. In future essays, Nuexco will discuss other unconventional types of transactions.

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NUEXCO

COMMENTARY

FRANCE AND NUCLEAR POWER

France is currently the world's leader among nations developing the use of nuclear power, largely due to the efforts of former President Giscard d'Estaing. However, the recent change in administration may affect the future of the French nuclear program. A new president, Mr. Mitterrand, has been elected and a parliament controlled by his Socialist Party is in place. Approximately two-thirds of Socialist Party members oppose nuclear power. The Communist Party has been awarded four of the 44 cabinet positions in a move to gain their support. The Communist Party strongly supports nuclear power. At issue then is what the various factors and factions will mean to France and nuclear power.

The new president has promised to "bring nuclear power under control" and to place increased emphasis on conservation and non-nuclear alternatives. However, forced to deal within the realities of the French situation, a need for a practical solution may be more important than ideology. Past commitments form a course which cannot be easily changed. How much President Mitterrand wants to change that course, and how much he can change, remains to be seen.

The foremost need of Mitterrand is a consolidation of his political position. He needs a base of political strength from which to carry out the Socialist reforms which are so important to him. A concentration of attention on nuclear power would arouse Conservative opposition and probably would not help his overall aims. Therefore, a downgrading of priority on the nuclear issue is likely.

A national aim has been to eliminate French dependence upon oil for electric power generation. Much progress has been made towards that end. Approximately 20 percent of the power produced this year in France will be from nuclear sources. By 1985, almost 60 percent is planned to be nuclear, and that will increase to 75 percent by 1990. Only three percent of France's electrical power will be derived from oil within ten years.

With this growing reliance upon nuclear power, France's involvement in the worldwide uranium market has expanded. France has become an important consumer of uranium, principally supplied from Niger, Gabon, South Africa and France itself. Its current consumption is approximately seven million pounds per year. The rate will increase to 11 million in 1985, and 18 million in 1990. Diversification of French supply is in progress to some extent. A commitment was made recently to purchase from Australia and there is involvement in exploration and production in the US and Canada.

The French nuclear industry has been almost wholly nationalized for many years. Electricite de France (EdF) is a government owned utility. The nuclear agency of the French government is the Commissariat à l'Energie Atomique (CEA). The CEA owns Cogema, the fully integrated nuclear fuel supplier. CEA also owns 30 percent of Framatome, the nuclear plant supplier. Since nuclear power is already substantially government controlled, further nationalization may have relatively little effect.

President Mitterrand must consider several important matters as he charts France's energy future. Economically, the French need to decrease dependence upon oil has not changed. Nuclear power provides France an energy cost advantage over other members of the European Economic Community. An estimated 150,000 workers in France are employed by the nuclear industry. Politically, France has gained international prestige by its demonstrated ability to take the lead among nuclear nations. A prestigious symbol will not be discarded lightly.

Many factors therefore point to only a moderate change in the course of the French program in the short term. The French nuclear program does have less fundamental political strength than it had before the elections. However, the change may not prove highly significant over the longer pull. Installation of a Socialist government in most other countries has increased business uncertainty and has led to slower economic growth. A slower growth of electricity demand as compared to past estimates is likely. Thus, a slowing of the nuclear program may be a more realistic road to travel.

Thus, French uranium consumption will be virtually unaffected until after 1985. The most likely near term consequence of the new government is a slowing, and possibly complete deferral, of new plant orders resulting in reduced consumption beginning about 1987 or 1988. The net effect might be to lower the rate of French demand in 1990 from 18 million pounds per year to perhaps 15 million. Reduction of worldwide demand would be of the order of three percent should that happen.

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URANIUM RESOURCES REEVALUATED

Introduction

Nuexco completed an evaluation of the Free World's reasonably assured resources (RAR) available at a forward cost below US$25 per pound U_3O_8 in April 1981 (see Nuexco Report 152, page 11). Recent events have caused those evaluation results to further decline primarily for RAR in South Africa and the United States. The downward change in RAR was expected due to rising operating costs and decreasing market prices for uranium concentrate.

The current reevaluation of RAR for the four principal uranium-resource countries of the world—Australia, Canada, South Africa and the US—shows a net 39 percent reduction of uranium availability at a forward cost below US$25 per pound U_3O_8 as compared to the below $50 estimate on page 23 of Nuexco's publication World Uranium Resources, November 1980. Table 4 presents Nuexco's estimate of RAR in the below US$25 per pound category for the four countries, plus an RAR summary for the remaining Free World.

Table 4

SUMMARY OF WORLD URANIUM RESOURCES REASONABLY ASSURED AT FORWARD COSTS BELOW $25 PER POUND U_3O_8

Country	Tonnes U_3O_8 7/1/81	Percent of Total
Australia	415,000	29
Canada	271,000	19
South Africa	242,000	16
US	317,000	22
Subtotal	1,245,000	
Namibia	90,000	6
Niger	72,000	5
Gabon	24,000	2
France	19,000	1
Total	1,450,000	100

Resource Status

United States—A reassessment of US reserves as published in DOE News, May 13, 1981 by the US Department of Energy (DOE) shows a reduction of RAR in all forward cost categories as of January 1, 1981 relative to U_3O_8 recoverable during the mining phase. (No adjustment was made for milling losses.) The most significant reductions occurred in the low unit-cost categories below $30. Available RAR in the below $15 category was reduced 50 percent—from 204,040 tonnes U_3O_8 in January 1980 to 102,000 tonnes in January 1981. DOE estimates the remaining tonnage at an average grade of 0.21 percent contained U_3O_8, all of which is considered available only in developed mines. Even so, actual recovery will depend on selective mining of higher grade ore in most operations. This in turn would potentially reduce the overall tonnage available in the below $15 category and jeopardize the eventual recovery of ores in the categories above $15. High-grading an orebody offers only temporary advantages—mostly economic; actually, it would further reduce RAR in all cost categories.

The 102,000 tonnes dropped from the below $15 category is considered to occur in undeveloped deposits and is therefore available as higher grade ore in the $15 to $30 category. Total RAR in the cost category up to $30 is estimated by DOE at 426,000 tonnes U_3O_8, down from 585,000 tonnes in 1980. However, only 317,000 tonnes are estimated by Nuexco to be RAR at the market level of $25 per pound U_3O_8. It represents a decrease of 46 percent from the January 1980 estimate by DOE at $30 per pound U_3O_8. It is espected that the total RAR considered available to the uranium industry today will continue to be downgraded for as long as the present downward market price trend continues, particularly in terms of real dollars. Table 4 lists Nuexco's estimate of RAR in the US at below $25 per pound U_3O_8.

South Africa—The Atomic Energy Board (AEB) of South Africa recently announced that all uranium resources had been reassessed to conform with the classification system recommended by the International Atomic Energy Agency (IAEA). The result was a sizeable reduction of RAR in the US$30 and $50 forward cost categories. The greatest reduction occurred in the below $30 category where essentially all RAR occurs in association with gold in the quartz-pebble conglomerates of the Witwatersrand system. The new estimate of RAR considered available in conglomerates is 243,000 tonnes U_3O_8 compared to the 364,000 tonnes estimated by Nuexco in World Uranium Resources, November 1980, page 1. Cost consideration for uranium in the conglomerates is more sensitive to market conditions for gold than

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uranium. The reduction of RAR for uranium reflects the depressed nature of the current gold market.

Other RAR in South Africa includes 41,000 tonnes U_3O_8 in gold tailings of the Witwatersrand district, about 3,500 tonnes in sediment of the Karoo Basin, and another 3,500 tonnes in association with copper ores in carbonatite at Palabora. RAR in the Karoo sediments are susceptible to additional reductions, if not complete elimination, as undeveloped resources in the present uranium market. Uranium in the tailings must be considered recoverable as a co-product to gold, otherwise it does not fit the RAR classification. At Palabora, the by-product recovery of uranium is directly affected by copper recovery operations.

Total RAR in all geologic environments of South Africa according to the estimate by the AEB are 291,000 tonnes U_3O_8 a decrease of 29 percent below an AEB estimate of September 1978. Mining and metallurgical losses have been factored into the final figure. The Nuexco estimate of RAR in the below $25 forward cost category is 242,000 tonnes U_3O_8 of which approximately 89 percent occurs within the Witwatersrand Basin. Nuexco's estimate is 17 percent below the current estimate at below $30 by the AEB.

Australia—Unofficially, uranium resources have grown in Australia. Energy Resources of Australia (ERA) announced on May 27 that geologic reserves on the Ranger No. 3 Orebody had increased approximately 14,000 tonnes contained U_3O_8, from 58,000 tones U_3O_8 to 72,000 tonnes, at an average grade of 0.188 percent U_3O_8. According to the ERA announcement the new reserves were located by the diamond drilling on the eastern segment of the orebody. Excellent potential remains to expand reserves by additional drilling in the northeast and southwest quadrants of the mineralized zones.

The new reserves are classified by Nuexco as RAR due to the favorable grade of the material and the fact that the Ranger project is under development with construction of the mine and mill progressing rapidly. (The Ranger No. 1 Orebody is being developed; No. 3 Orebody will be developed at a later date.) Total RAR for the Ranger project is 125,000 tonnes U_3O_8 of which 53,000 tonnes U_3O_8 is known to occur in the No. 1 Orebody at an average grade of 0.33 percent U_3O_8.

Nuexco's estimate of RAR for Australia at a forward cost below $25 is upgraded to 415,000 tonnes U_3O_8. It includes in addition to Ranger, the RAR of Jabiluka, Koongarra, Yeelirrie, and Mary Kathleen. The increase is only three percent above previous Nuexco estimates, however, it is significant that 363,000 tonnes (88 percent) of the total RAR occurs in high-grade deposits located in the Northern Territory. The potential to increase RAR in the Northern Territory by extensions of known deposits and/or new exploration is excellent. The status of the remaining 52,000 tonnes U_3O_8 in the below $25 category is less certain. Further decline in the market value of U_3O_8 and continued high operating costs could force the Mary Kathleen operation to cease operations and reduce the RAR by 6,000 tonnes. The same circumstances may delay indefinitely the development of the Yeelirrie deposit in Western Australia. In that case, 46,000 tonnes U_3O_8 would be reclassified into a higher forward cost category.

Canada—Uranium resources of Canada are assessed each year by the Department of Energy Mines & Resources (EMR). Their classification of measured and indicated resources is equivalent to the RAR classification by the IAEA. However, the resources are based upon quantities of uranium ore minable in forward cost categories of up to US$50 per pound.

The last official estimate covers RAR through the end of 1979. In Report EP 80-3, Uranium in Canada, 1979 Assessment of Supply and Requirements, the EMR lists RAR at 271,000 tonnes U_3O_8 at a forward cost below $50. It represents an increase of almost 17 percent above the 1978 figure, most of which is credited to further evaluation of the Key Lake deposit located in northern Saskatchewan. EMR estimates that almost 90 percent of RAR are associated with deposits that are now in production or committed for production.

The Nuexco estimate of RAR at a forward cost below $25 in Canada corresponds to the EMR estimate of 271,000 tonnes at costs below $50. There is no downward adjustment by Nuexco because all RAR are included in operating mines or are part of the high-grade deposits in northern Saskatchewan. In this circumstance, the resources are considered to remain available even at a forward cost of $25. Nuexco considers approximately 39 percent or 105,000 tonnes U_3O_8 of all RAR, to be located in four deposits of the Saskatchewan district—Cluff Lake = 18,000 tonnes, Key Lake = 70,000 tonnes, Rabbit Lake = 10,000 tonnes and Eldorado = 7,000 tonnes. Of the

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remaining 166,000 tonnes, about 161,000 are located in the Elliot Lake district of Ontario; the remaining 5,000 tonnes are located in small deposits throughout Canada.

The ratio of RAR distribution will probably change in the near future. The reclassification of resources into the RAR category for several large high-grade deposits in northern Saskatchewan is pending completion of late-stage evaluation work. Final evaluation of deposits at Collins Bay A & B, Midwest Lake, Horseshoe and Raven, McClean Lake, and Maurice Bay could increase RAR by another 140,000 to 180,000 tonnes U_3O_8. The total increase is not imminent—each project is at a different stage of evaluation. However, the addition of RAR at the Collins Bay A & B deposits and the Midwest Lake deposit could be included in the next estimate by EMR. The remaining deposits may not be reclassified as RAR for several more years.

Table 4 lists Nuexco estimates of RAR recoverable at a forward cost below US$25 per pound U_3O_8 for Australia, Canada, South Africa and the US. RAR for the rest of the Free World remains unchanged from Nuexco Report 152, April 1981. The percentage of RAR per country as compared to the world total is also listed.

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STATISTICAL DATA

EXCHANGE VALUE $24.25/lb. U_3O_8
Determined as of June 30, 1981

Definition

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

Derivation

Nuexco bases the Exchange Value upon:

A. Data from recently completed transactions.

B. Data from pending transactions.

C. Firm bids to buy and firm offers to sell.

D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Exchange Value:

A. The price of uranium delivered or to be delivered under old contracts.

B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

TRANSACTION VALUE
Determined as of June 30, 1981

$/lb U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
24.50	2.9	10	6

Definition

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for U_3O_8 in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds U_3O_8 are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

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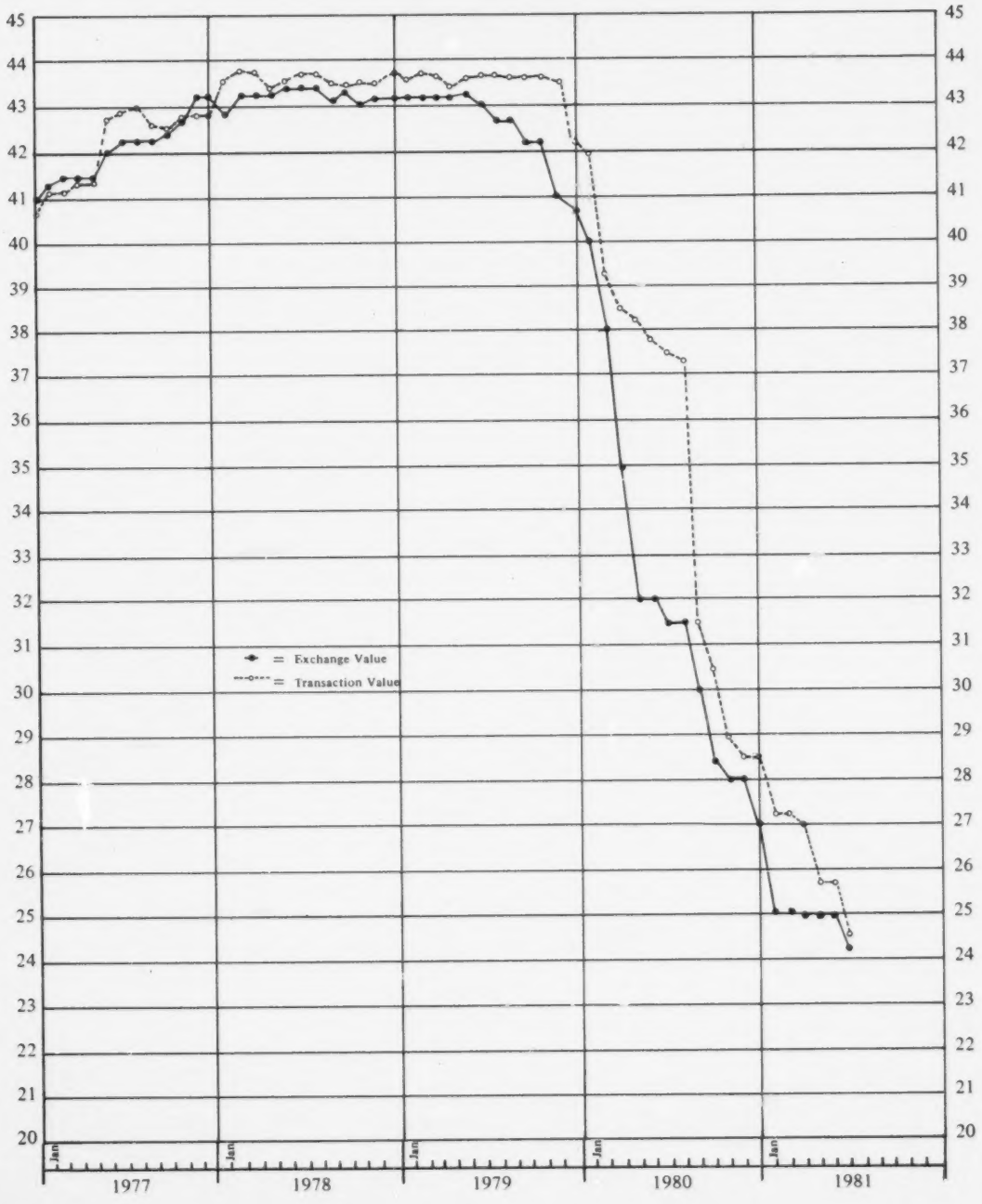
STATISTICAL DATA

EXCHANGE AND TRANSACTION VALUES
SINCE JANUARY 1977
Determined as of the last day of the month indicated



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STATISTICAL DATA

HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	–	–	–	–	–	–	–	6.35	6.35	6.40	6.45	6.50
1969	–	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25						

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	–	–	–	–	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50						

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES*

Country	per lb U_3O_8 in Concentrates	per kg U_3O_8 in Concentrates	per kg U in Concentrates
US (dollar)	24.25	53.46	63.04
France (franc)	138.10	304.45	359.02
FRG (mark)	57.95	127.75	150.64
Japan (jen)	5,484	12,090	14,257
Switzerland (franc)	49.33	108.75	128.24
UK (pound)	12.45	27.45	32.37
Australia (dollar)	21.12	46.56	54.91
Canada (dollar)	29.09	64.13	75.63
Niger, Gabon (CFA)	6,905	15,223	17,951
South Africa (rand)	21.38	47.12	55.57
Sweden (Krōner)	123.47	272.21	321.00

*Calculated using currency exchange rates published in the Wall Street Journal on the last business day of the month.

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STATISTICAL DATA

CONVERSION VALUE $1.15/lb. U as UF_6
Determined as of June 30, 1981

Definition

The Conversion Value is Nuexco's judgment of the price at which spot and/or near term transactions for significant quantities of conversion services could be concluded in the secondary market as of the last day of the month.

Derivation

Nuexco bases the Conversion Value upon:

A. Data from recently completed transactions.

B. Data from pending transactions.

C. Firm bids to buy and firm offers to sell.

D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Conversion Value:

A. The price of conversion services delivered or to be delivered under old contracts.

B. The price of conversion services delivered in connection with contract renegotiations or other than arm's length transactions.

UF_6 VALUE $65.90/kg. U as UF_6

Definition

The UF_6 Value is the price of a kilogram of U as UF_6 based on the Exchange Value and the Conversion Value, and assuming one-half percent conversion loss.

LOAN USE CHARGE RATE 5-1/2%
Determined as of June 30, 1981

Definition

The Loan Use Charge Rate is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the last day of the month.

Derivation

Nuexco bases the Loan Use Charge Rate upon:

A. Data from recently completed or pending loan transactions.

B. Rates included in firm proposals to borrow or lend.

C. Rates that potential borrowers and lenders have expressed as a willingness to pay or accept, but for which Nuexco is not aware of firm proposals.

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STATISTICAL DATA

CURRENT TRANSACTIONS*

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as percent of Current E.V.	Seller Group	Buyer Group	Remarks
Uranium Transactions						
1539	81–91	301–600	–	US	US	Price is market related
1544	81	101–300	–	US	US	Loan
1547	81	301–600	99	US	US	
1548	81	301–600	99	US	US	
Conversion Transactions						

*Transactions listed include not only those in which Nuexco was involved, but also all others of which Nuexco is aware.

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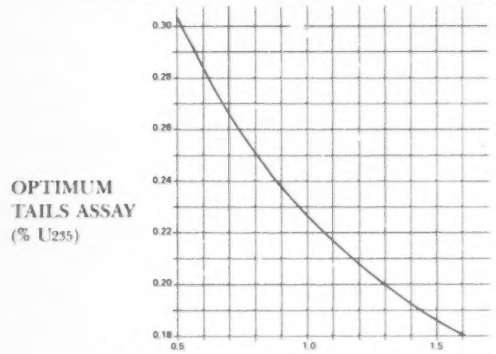
STATISTICAL DATA

OPTIMUM TAILS ASSAY

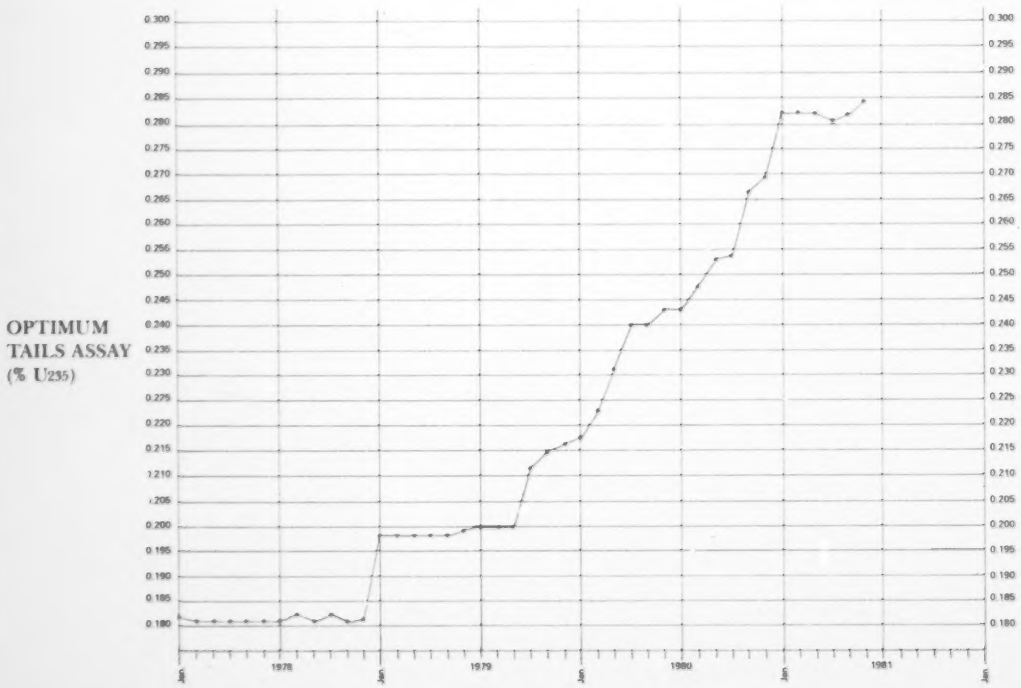
The optimum tails assay is the tails composition at which the cost of enriched uranium is lowest for given costs of separative work (SWU) and natural uranium feed. It depends only on the ratio of the cost of a kilogram of natural uranium in the form of UF_6 to the cost of a kilogram unit of separative work. The US Department of Energy (USDOE) Adjustable Fixed Commitment (AFC) enrichment contract holders have the option, within limits, to specify the transaction tails assay. The transaction tails assay for USDOE Requirements contracts is 0.2 percent U_{235}. For every one-hundredth of one percent increase in the transaction tails assay, uranium consumption increases about two percent.

TAILS ASSAY FOR MINIMUM COST OF PRODUCT*



*From Nuexco Report 158

OPTIMUM TAILS ASSAY[1]



[1]Based on Exchange Value and USDOE AFC SWU price; interpolated to the nearest thousandth.

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STATISTICAL DATA

US GOVERNMENT STATISTICS

	Producer Price Index—Industrial Commodities (1967 = 100)[1]	Consumer Price Index (1967 = 100)[2]	GNP Implicit Price Deflator (1972 = 100)[3]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
				Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
Ann. Avg. 1970[(5)(7)]	110.0	116.3	91.36	3.88	3.87	3.69	3.28
Ann. Avg. 1971[(5)(7)]	114.1	121.3	96.02	4.12	4.15	3.97	3.49
Ann. Avg. 1972[(5)(7)]	117.9	125.3	100.00	4.56	4.59	4.26	3.71
Ann. Avg. 1973[(5)(7)]	125.9	133.1	105.80	4.84	4.98	4.51	3.91
Ann. Avg. 1974[(5)(7)]	153.8	147.7	116.02	5.44	5.63	4.88	4.21
Ann. Avg. 1975[(5)(7)]	171.5	161.2	127.15	6.13	6.24	5.39	4.64
Ann. Avg. 1976[(5)(7)]	182.4	170.5	133.71	6.76	6.87	5.91	4.96
Ann. Avg. 1977[(5)(6)(7)]	195.1	181.5	141.70	7.28	7.67	6.43	5.39
Ann. Avg. 1978[(5)(6)(7)]	209.4	195.4	152.05	8.23	8.56	7.02	5.82
Ann. Avg. 1979[(6)(7)]	236.5	217.4	165.46	9.27	9.49	7.60	6.32
Ann. Avg. 1980	274.5	246.8	177.36	10.26	10.61	8.29	6.96
Feb 1980	265.9	236.4	–	9.92	10.01	8.01	6.71
Mar 1980	268.6	239.8	174.48	9.90	10.22	8.05	6.78
Apr 1980	271.3	242.5	–	10.00	10.30	8.12	6.79
May 1980	271.9	244.9	–	10.18	10.37	8.17	6.78
Jun 1980	273.5	247.6	178.93	10.13	10.69	8.24	6.87
Jul 1980	276.2	247.8	–	10.24	10.82	8.35	6.96
Aug 1980	278.2	249.4	–	10.38	10.78	8.39	7.02
Sep 1980	278.8	251.7	182.92	10.54	10.94	8.46	7.14
Oct 1980	282.2	253.9	–	10.58	11.00	8.52	7.20
Nov 1980	283.4	256.2	–	10.73	11.06	8.59	7.29
Dec 1980	286.6	258.4	183.98	10.86	11.31	8.68	7.39
Jan 1981	291.2R	260.5	–	10.93	11.30	8.73	7.42
Feb 1981	294.8	263.2	–	11.16	11.35	8.79	7.45
Mar 1981	298.9	265.1	187.30	11.14	11.49	8.84	7.49
Apr 1981	302.8	266.8	–	11.26P	11.64P	8.91P	7.52P
May 1981	304.1P	269.0P	–	–	–	8.96P	7.56P

P = Preliminary R = Revised since last month

(1) US Bureau of Labor Statistics, Washington, D.C.; "Producer Prices and Price Indexes," Table 6 (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

(2) US Bureau of Labor Statistics, Washington, D.C.; Consumer Price Index for All Urban Consumers, US City Average, All Items.

(3) US Department of Commerce, Washington, D.C.; Bureau of Economic Analysis, National Income and Wealth Division; "Survey of Current Business," Table A. The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

(4) US Bureau of Labor Statistics, Washington, D.C.; "Employment and Earnings," Table C-2. All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for January 1977 and beyond are adjusted to the March 1979 benchmark.

(5) Monthly data 1970-1978 for Price Indexes and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNP Implicit Price Deflator appear on pages 4.6-4.8 of Nuexco Report 139.

(6) Monthly data 1977-1979 for Employment and Earnings SIC codes 10, 333, and 28 appear on page 33 of Nuexco Report 147.

(7) Monthly data 1970-1979 for Employment and Earnings SIC code 36 appear on page 23 of Nuexco Report 154.

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AUSTRALIAN GOVERNMENT STATISTICS

	Price Index of Materials Used in Manufacturing Industry—All Groups (Year 1968-69 = 100.0)[1]	Weighted Average Minimum Weekly Wage Rates—Adult Males Australia Mining and Quarrying (A$)[2]
Annual Avg. 1970 (3)	101.4	59.88
Annual Avg. 1971 (3)	101.5	65.95
Annual Avg. 1972 (3)	105.6	71.26
Annual Avg. 1973 (3)	124.4	78.96
Annual Avg. 1974 (3)	141.9	108.07
Annual Avg. 1975 (3)	150.4	132.55
Annual Avg. 1976 (3)	168.4	160.93
Annual Avg. 1977 (3)	192.0	179.03
Annual Avg. 1978 (3)	198.5	190.04
Annual Avg. 1979	248.8	196.34
Annual Avg. 1980	321.7	217.75R
Feb 1980	345.6	215.20
Mar 1980	340.3	214.83
Apr 1980	327.9	214.14R
May 1980	335.1	214.81
Jun 1980	338.4	214.14
Jul 1980	349.1	221.44
Aug 1980	353.2	219.95
Sep 1980	351.6	219.45
Oct 1980	349.5R	220.73
Nov 1980	351.7R	221.10
Dec 1980	353.0	221.43
Jan 1981	359.1	228.30
Feb 1981	358.0	228.12
Mar 1981	356.6	227.34
Apr 1981	355.7P	227.05P

P = Preliminary R = Revised since last month

(1) Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0), Table 3.
(2) Australian Bureau of Statistics, Canberra: "Wage Rates, Australia" (Catalogue No. 6312.0), Table 1. Figures for the latest fourteen months shown are subject to revision.
(3) Monthly data for 1970 through 1978 appear on pages 4.7 and 4.8 of Nuexco Report 138.

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STATISTICAL DATA

CANADIAN GOVERNMENT STATISTICS

	Industry Selling Price Index: Manufacturing (D 500000)[1,2] (1971 = 100.0)	Wage-earner Data: Average Hourly Earnings (C$)[3,4]		
		Metal Mining, including milling (SIC 050-059)	Primary Metal Industries, non-ferrous (SIC 296-298)	Chemicals and Chemical Products (SIC 370-379)
Annual Avg. 1977	174.3	8.18	6.50	6.51
Annual Avg. 1978	190.4	8.76	6.82	6.97
Annual Avg. 1979	217.9	9.60	7.35	7.67
Annual Avg. 1980	247.2R	10.59	8.05	8.50
Feb 1980	240.8	10.11	7.69	8.08
Mar 1980	239.5	10.34	7.83	8.26
Apr 1980	241.1	10.40	7.94	8.36
May 1980	242.4	10.50	8.01	8.44
Jun 1980	243.7	10.51	8.07	8.46
Jul 1980	246.3	10.49	8.11	8.55
Aug 1980	249.4	10.58	8.14	8.65
Sep 1980	252.0	10.85	8.24	8.71
Oct 1980	256.0	11.05	8.28	8.82
Nov 1980	257.7	11.11	8.38	8.77
Dec 1980	258.3	11.13	8.32	8.92
Jan 1981	263.1R	11.27	8.51	8.90
Feb 1981	263.3R	11.43P	8.60P	8.99P
Mar 1981	265.2	11.39P	8.61P	9.14P
Apr 1981	267.0P	–	–	–

P = Preliminary R = Revised since last month

(1) Statistics Canada, Prices Division, Ottawa; "Industry Price Indexes" (Catalogue 62-011), Table 1. Indexes for the most recent six months shown are subject to revision.
(2) Monthly data for 1973 through 1978 appear on page 4.10 of Nuexco Report 138.
(3) Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa; "Employment, Earnings and Hours" (Catalogue 72-002), Table 2.
(4) Monthly data for 1977 and 1978 appear on page 4.11 of Nuexco Report 138.

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STATISTICAL DATA

REPUBLIC OF SOUTH AFRICA STATISTICS

	Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Consumer Price Index[2] (1975 = 100, except where otherwise indicated)	Wholesale Price Index All Groups (1975 = 100)
Annual Avg. 1970[3]	7.34	100.3[4]	
Annual Avg. 1971[3]	7.88	106.4[4]	59.1
Annual Avg. 1972[3]	8.79	113.3[4]	63.9
Annual Avg. 1973[3]	10.51	124.1[4]	72.3
Annual Avg. 1974[3]	13.18	138.5[4]	85.3
Annual Avg. 1975[3]	16.71	157.2[4]	100.0
Annual Avg. 1976[3]	19.30	174.7[4]	115.1
Annual Avg. 1977[3]	23.87	194.4[4]	130.0
Annual Avg. 1978[3]	27.14	137.2	142.7
Annual Avg. 1979[3]	30.18	155.3	164.5
Annual Avg. 1980	35.53	176.7	192.1
Feb 1980	–	167.0	180.5
Mar 1980	33.65	168.0	181.7
Apr 1980	–	170.0	184.2
May 1980	–	171.9	187.0
Jun 1980	34.48	174.6	189.0
Jul 1980	–	177.2	192.7
Aug 1980	–	179.2	196.8
Sep 1980	36.19	182.8	199.8
Oct 1980	–	186.3	203.1
Nov 1980	–	187.8	205.6
Dec 1980	37.69	189.9	206.5
Jan 1981	–	191.0	207.2
Feb 1981	–	193.8	209.8
Mar 1981	39.26	195.2	209.9
Apr 1981	–	196.4	211.6
May 1981	–	197.7	–

(1) Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly.
(2) Republic of South Africa Department of Statistics, Pretoria: "Government Gazette: Consumer Price Index for Urban Areas."
(3) Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Nuexco Report 140.
(4) April 1970 = 100.00.

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MARKET OPPORTUNITIES

Market Opportunities are *active* inquiries in the uranium market to buy, sell, borrow or lend. The data presented in this section are in no way intended to be indicative of the entire uranium market for the time period covered.

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U_3O_8) 0 to 1 Year	1 to 2 Years	2 to 3 Years	Remarks
Available for Sale:				
1392	400			
1393			350	
1475	1250			UF_6
1480	300	300	300	
1540	300	750		UF_6
1550	600			
1552	200			
1562			150	Long term
1575		500	500	Long term
1576	250			
1581	100	150	150	Long term
1595	600	600	800	
1600			200	Long term
1630	500			UF_6
1637	500	500		
1678		275		
1685	100			
1698	100			
TOTAL	5200	3075	2450	
Available for Loan:				
1429	300			UF_6
1602	400			
1646	275	275	275	
1671	300			
1695	225	325	325	UF_6
TOTAL	1500	600	600	

*Measured from the date of this Report.

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MARKET OPPORTUNITIES

Market Opportunities are *active* inquiries in the uranium market to buy, sell, borrow or lend. The data presented in this section are in no way intended to be indicative of the entire uranium market for the time period covered.

URANIUM DEMAND

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U_3O_8) 0 to 1 Year	1 to 2 Years	2 to 3 Years	Remarks
Inquiries to Purchase:				
1423	1000	1000		
1459			200	Long term
1462			100	Long term
1514		400		
1529			550	Long term
1603		100	100	Long term
1634		400	400	
TOTAL	1000	1900	1350	
Inquiries to Borrow:				
1621	300			
1686	200			
1699	225	1000		
TOTAL	725	1000		

***Measured from the date of this Report.**

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MARKET OPPORTUNITIES

Market Opportunities are *active* inquiries in the secondary market for UF_6 conversion services. The data presented in this section are in no way intended to be indicative of the entire market for the time period covered.

CONVERSION SUPPLY

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U as UF_6) 0 to 1 Year	1 to 2 Years	2 to 3 Years	Remarks
1451	75			
1609	1000	900	1000	
1619		200	100	
1630	400			
1661		400	400	Long term
TOTAL	1475	1500	1500	

CONVERSION DEMAND

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U as UF_6) 0 to 1 Year	1 to 2 Years	2 to 3 Years	Remarks
1594		400	950	Long term
1622		400	400	Long term
1626	75			
1688	1300			
1689	150	300	300	Long term
TOTAL	1525	1100	1650	

***Measured from the date of this Report.**

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AUGUST 1981 NUMBER 156

Monthly Report on the Uranium Market

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MONTHLY REPORT ON THE URANIUM MARKET
August 1981 No. 156

JAMES E. VAUGHAN, *EDITOR* TERESA T. ELMS, *ASSOCIATE EDITOR*

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FORWARD

Nuexco will be hosting a hospitality suite during the Atomic Industrial Forum, Inc. Canadian Nuclear Association "International Conference on Uranium." The suite will be at the Loews Le Concorde in Quebec City, Canada, September 15-18, 1981.

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URANIUM MARKET

AFRICA

South African production figures of gold-uranium operations for the second quarter 1981 have recently been released and are as follows:

Table 1

SOUTH AFRICAN GOLD-URANIUM PRODUCTION SECOND QUARTER 1981

Operation	Pounds U_3O_8 Produced
Blyvoorvitzicht	187,646
Buffelsfontein	361,900
CHEMWES	362,540
ERGO	180,320
Harmony	322,504
Hartebeestfontein[1]	268,534
J.M.S.	582,905
Randfontein	324,117
Vaal Reefs[2]	921,360
West Dreifontein	130,728
West Rand Consolidated	178,226
Western Deep Levels	129,406
Total	3,950,190

(1) The reclamation and treatment of accummulated uranium bearing slimes remains suspended in order to limit cash invested in stockpiled U_3O_8. Forward sales commitments will be fulfilled by production from the currently milled ore.

(2) Due to delays in the uranium section of the Afrikander Lease area plant, Vaal Reefs has announced that this portion of the plant will not be commissioned until the second quarter, 1982. There was no uranium production from Afrikander Lease in the second quarter, 1981, as the tonnage mined was stockpiled in anticipation of commissioning of the uranium plant in 1982.

West Rand Consolidated Mines Ltd. announced recently that its uranium production will be stopped as soon as practical because of economic considerations. The production of gold at the mine will continue. Increased development of the mine showed sufficient gold reserves to justify gold output only.

Despite current market conditions, other South African uranium production efforts are continuing. The construction of Western Area's uranium plant is proceeding and commissioning is anticipated before 1981 year end.

Additionally, Beisa Mines Ltd. No. 1 shaft reached its final depth of 1071 meters and shaft installation and equipping has begun. About 1826 meters of underground development were completed during the second quarter. The construction of the uranium and gold extraction plants is virtually complete and commissioning is in progress.

AUSTRALIA

Pancontinental Mining Ltd. and other mining companies have received a boost from the Aboriginal Land Commissioner's report on aboriginal land claims in the Northern Territory. The report rejected 90 percent of the claims in the Alligator River area, a positive sign for the producers interested in exploration and development there. The recommendations contained in the report still must be ratified by the federal government. Claims by four aboriginal clans for land including the Jabiluka uranium deposit resulted in a recommendation for the land to be granted to a land trust.

Compensation arrangements with the traditional owners in the area are now moving forward. Pancon will make payments of A$16 million over a ten year period with most of the money going to the Northern Land Council for use in various aboriginal projects and facilities.

Pancon has decided to raise A$22 million by making a one-for-one share issue. This move reflects the current strained cash situation of the company. However, it also displays confidence in obtaining government approval for the Jabiluka project. The funds raised will be used to finance what is becoming a a broadly based exploration effort. The company's exploration budget is running at about A$3 million per year including funds for exploration for base metals and other minerals.

Uranium production plans by Pancon call for an initial mining production of 6.6 million pounds U_3O_8 per year. Design milling capacity will be ten million pounds U_3O_8 per year. The company believes that project approval by the government is imminent. Agreements with aboriginal groups are expected by the end of September, 1981. Also still to be settled is the Unless an exemption is granted, Getty must reduce its interest from 35 to a maximum of 25 percent to rearrangement of equity holding with Getty Oil Co.

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conform to Australian foreign investment standards in uranium mines.

CANADA

Eldorado Nuclear Ltd. received approval last month for construction of a new uranium trioxide refinery in Blind River, Ontario. The proposed refinery satisfactorily passed evaluation by the Atomic Energy Control Board (AECB) and various health and safety ministries and agencies. Eldorado will still be required to apply for a license from the AECB before the plant can be put into operation.

The AECB also gave site approval to Eldorado's proposed expansion of its uranium hexafluoride conversion facilities at Port Hope, Ontario. Eldorado recently received a directive to upgrade Port Hope's current monitoring and control programs for airborne emissions. A construction license for the expansion would be contingent on these same improvements.

The topic of conversation in Canadian uranium circles lately revolves around the charges brought against six companies under the Combines Investigation Act. The essence of the charges is that the cartel of the early 1970's, in addition to affecting international prices, also caused Canadian consumers, specifically Ontario Hydro, to pay more for uranium than they would have otherwise. A Nuexco Topical Report was published in October 1976, covering the multitude of reasons for the rapid price increase in the mid-1970's.

FAR EAST

A special advisory committee on nuclear power to Japan's Ministry of International Trade and Industry (MITI) has submitted its policy recommendations for future Japanese energy security. A similar report was last issued in 1978.

The report must be viewed in relation to the Japanese government's previously announced nuclear generation target of 51,000 to 53,000 MWe installed capacity by 1990 and 74,000 to 78,000 MWe by 1995. Assuming such objectives can be achieved, the report indicates that Japan's current "long" uranium position may become a short position in the early 1990's. Important points of the report related to uranium supply are:

1. Japanese utilities currently have scheduled approximately 196,000 short tons of U_3O_8 for future delivery under long-term contracts (See Nuexco Monthly Report 154, June 1981).

2. Additional commitments of 130,000 short tons of U_3O_8 are forecast to be needed for the period 1990-2000.

3. Less than 20 percent of existing uranium supply commitments comes from participation in overseas production. The remaining commitments are from conventional long-term contracts with producers. The report encourages greater participation in independent or joint venture developments overseas.

4. Current procurement is concentrated in a limited number of geographical areas. The MITI report recommends further diversification with reliable suppliers.

5. The report recommends closer cooperation between Japan's utilities and other Japanese companies in joint procurement and development ventures overseas.

6. Because of Japan's complete dependence on foreign uranium supply, the report suggests that consideration be given to actual stockpiling of uranium in Japan. A minimum of one year's supply is recommended. Examples of previous supply interruption due to embargoes and transportation strikes are cited as evidence of such a stockpile need.

As noted earlier, the above recommendations are based on the government's officially announced objectives for nuclear generation for 1990 and 1995. Nuexco, in a *Topical Essay* "Japan's Nuclear Growth: Hope vs. Reality" (Nuexco Monthly Report 153, May 1981), reviewed the realities of achieving such goals. It was noted that 40,000 MWe of installed nuclear generation by 1990 would be a noteworthy performance and would be possible only under very favorable circumstances.

Related topics in the MITI report indicate that the Japanese nuclear program is indeed moving forward and that Japan should be classified as one of the more active nuclear markets in the world. Although the report could be viewed as encouraging new long-term procurement moves by Japanese utilities, some degree of caution in evaluating these latest policy recommendations is needed particularly as it becomes more apparent that the official 1990 target is unlikely to be met. One possible result may be an effort to implement

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the stockpiling recommendations. Since the principle motivation behind this suggestion appears to be security of supply, it seems logical that any stockpiling in Japan would be in the form of enriched product.

In mid-July Tokyo Electric Power Company (TEPCO) officially announced the placing of contracts for two additional 1100 MWe Boiling Water Reactors (BWR's). Kashiwayaki Unit 2 was awarded to Toshiba and Kashiwayaki Unit 5 was awarded to Hitachi. Both units are scheduled for operation in the late 1980's. With these two commitments, TEPCO's nuclear program totals approximately 12,400 MWe. This figure covers plants operating, under construction and those firmly on order.

A breakdown of this figure includes the Fukushima I site which contains six operating units with a capacity of 4700 MWe, and the Fukushima II site which has four units with a capacity of 4400 MWe. One of the Fukushima II units is undergoing power tests and the remaining three are scheduled for operation prior to 1986.

Also included is the Kashiwayaki site which consists of two areas. Units 1 through 4 are located in one section, and Units 5 and 6 and possibly Unit 7 are in the other. With Unit 1 scheduled to start, construction of Units 2 and 3 in order would result in excessive congestion in the narrow site. Thus TEPCO jumped to the second area and contracted for Unit 5 at the same time as Unit 2 as noted above. Units 3, 4, 6 and 7 have not yet been ordered. Units 1, 2 and 5 have a combined capacity of 3300 MWe.

The Japanese Agency of Natural Resources and Energy of MITI studied the comparative costs of electric generation in Japan. The results are presented in Table 2.

UNITED STATES

This past month again saw producers reacting to the uranium market slump with decisions to cut back or halt production. At the same time, there were a few announcements of resumptions or start-ups of production facilities.

Ranchers Exploration Corp. announced that it is closing its Hope Mine operation near Grants, New Mexico. In the fiscal year ending June 1980, the facility produced 93,000 pounds U_3O_8.

Further cutbacks were announced by Petrotomics Co. at its Shirley Basin, Wyoming mill. The mill's uranium processing will be cut to about 750 tons per day beginning August 1. Approximately one-third of the Shirley Basin mine's work force (130 workers) were laid off in March, 1981.

Union Carbide Corp., however, will resume operations at its Uravan, Colorado mill in September. The mill has a 1,200 ton per day capacity. Activity there has been stopped since March 1, 1981 because firm contract requirements could be met with only six months production.

Also moving forward is Ogle Petroleum's in-situ uranium project at Bison Basin, Wyoming. Ogle plans to begin commercial operation of the facility in mid-August.

Table 2

COMPARATIVE COSTS OF ELECTRIC GENERATION IN JAPAN

Type of Generation	1981 Delivered Cost US ¢/kwhe	Average Construction Cost of Plant Starting Operation in 1981 US $/KWe	Estimated Construction Cost of Plants Scheduled for 1985 Startup US $/KWe	1981 Fuel Cost as % of Generation Cost
Nuclear	4.8—5.3	1,066—1,111	1,422—1,466	25
Imported Coal	6.2—6.6	800—850	1,066—1,111	55
Liquified Natural Gas	7.5—8	622—666	755—800	75
Conventional Hydro	8—8.5	2,400—2,511	2,933—2,977	0
Oil	8.5—9	488—533	711—755	80

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URANIUM MARKET

TRANSACTIONS

There are three uranium transactions reported this month. The first involved the sale of between 100 thousand and 300 thousand pounds U_3O_8 from a US utility to a US producer, with delivery to take place later this year. The second was a sale of between 100,000 and 300,000 pounds U_3O_8 from a US seller to a Far East utility. Delivery is scheduled for late this year. The last transaction was a sale of between 300,000 and 600,000 pounds U_3O_8 equivalent from a US seller to a Far East utility for delivery late this year. The latter two transactions are related to each other and involve a trading company. The complex nature of the transactions makes it impractical to tabulate the approximate price on the Current Transactions page of this Report.

There are two conversion transactions reported this month. The first was a sale of between one million and two million pounds U of conversion between two US utilities, with delivery taking place between 1983 and 1985. The second sale was from a US utility to a non-US user. Between 300 thousand and 600 thousand pounds U for immediate delivery were involved.

PRICING

The **Exchange Value** decreased again this month to $23.50, from $24.25 the previous month. The major driving forces for the change are as follows:

1. During the month a new buyer entered the market for a substantial near-term purchase. Spirited competition developed among several sellers in an effort to obtain this business, thus putting renewed downward pressure on the market. The buyer is now in serious negotiations with the successful sellers to close this transaction.

2. The unsuccessful sellers indicated a willingness to sell at prices less than the previous month's Exchange Value. These sellers continue to offer material at prices about the level of this month's Exchange Value.

3. The near-term market continues to be imbalanced, as indicated in the *Market Opportunities* section of this Report. Material available for sale amounts to about 5.4 million pounds U_3O_8, while near-term inquiries to purchase total 1.4 million pounds. The numbers indicate a narrowing of the supply-demand gap over the past few months. This is principally because several significant near-term transactions have closed recently, and others are in serious negotiation. It is apparent that as new buyers enter the market, they attract considerable competition among sellers, thus further eroding prices. About two-thirds of the material currently available for sale in the near term is being offered by inventory holders. Some inventory holders have become most aggressive in their roles as sellers.

The **Transaction Value** decreased slightly to $24.10 per pound U_3O_8. The ten qualifying transactions took place over the last five months when prices were fairly steady. The total amount of material considered in this month's Transaction Value was 2.9 million pounds.

The uranium loan market is continuing to attract interest from potential borrowers and lenders. The **Loan Use Charge Rate** remained at the previous month's level of 5½ percent.

CONVERSION

The **Conversion Value** remained at $1.15 per pound U for the third straight month. Two secondary market transactions closed this month. One was an intermediate term sale at prices close to the Conversion Value. The other was a near-term sale at prices less than the Conversion Value. The latter was a *deconversion* transaction whereby a uranium inventory holder had entered into a sales agreement conditioned on the seller's making a deconversion swap. This was necessary because the seller's inventory was in the form of UF_6 and the uranium buyer required material in the form of concentrates.

The deconversion swap has proved to be a useful device for many reasons. From the standpoint of the UF_6 holder:

1. The uranium is often more readily salable in the form of concentrates.
2. Concentrates are easier and cheaper to store.
3. Purchase of UF_6 cylinders would be obviated.
4. The UF_6 holder may wish to obtain concentrates to fulfill another conversion obligation.

From the standpoint of the concentrates holder, the major advantage to the deconversion swap is that the material can be upgraded to UF_6 usually at a small percentage of the price normally paid to primary conversion contractors for this service.

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URANIUM MARKET

As indicated in the *Market Opportunities* section of this Report, the total of secondary market conversion services available for near-term sale is about 2.3 million pounds U. Total near-term demand is about one million pounds U.

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TOPICAL ESSAY

UNCONVENTIONAL TRANSACTIONS: PART II, OPTIONS

As uranium prices continue to decline, market participants are expressing more interest in pursuing unusual transactions to offset the uncertainty of future price developments. In Nuexco Report 155, one such technique, that of inventory upgrading, was discussed. In this essay another tool, the option, will be examined.

On Wall Street, the option is an established and accepted market tool. In the uranium industry it has been limited primarily to option clauses attached to sales contracts. Recently, though, there has been an upsurge in interest in the straight purchase of options.

Option Candidates

The most likely candidate to *purchase* an option to buy uranium would be a producer who has both existing delivery contracts and production costs at or above the current market price. This producer will probably already be contemplating shutting down existing production facilities or discontinuing plans to bring new production on line. However, the producer may not wish to commit to any irreversible action such as a direct purchase.

The most likely candidate to *sell* an option would be a utility with significant excess uranium inventory. Alternately, any uranium producer with uncommitted production might be interested in selling an option.

Advantages

While some of the advantages of buying an option also apply to the outright purchase of material, and more specifically the potential economic advantage of purchasing rather than producing (see the *Topical Essay* in Nuexco Report 144, "Produce or Procure: The Uranium Version of Make Vs. Buy"), the additional element which the option buyer gains is flexibility. With an option, the producer can safely make plans to cut back on production while watching for market developments. If the price goes up significantly, it may not be necessary to shut down existing production. If the price goes up slightly or holds steady, the producer would have an in-place contract to fill its needs at or below market price value. If, on the other hand, the market price goes down, the producer can purchase the material elsewhere and allow the option to expire.

The option flexibility allows a producer to make the decision to curtail production immediately without concern about filling near term contractual commit-

Table 3
EXAMPLE OF CALCULATION OF EXPECTED SAVINGS FOR A PURCHASER OF AN OPTION

Option Exercise Price ($/lb. U_3O_8)	Market Price in One Year ($/lb. U_3O_8)	Value of Option ($/lb. U_3O_8)	Probability of Market Price	Expected Value ($/lb. U_3O_8)
23.50	25.50	2.00	1/6	0.333
23.50	24.50	1.00	1/6	0.167
23.50	23.50	0.00	1/3	0.000
23.50	22.50	0.00	1/6	0.000
23.50	21.50	0.00	1/6	0.000
Total Expected Value of Savings Due to Purchase of Option:				0.500
Less Option Price:				(0.25)
Net Expected Savings:				0.25
For One Million Pound Option, Total Expected Savings:				$250,000

Assumptions:
A. Option Price is $0.25/lb. U_3O_8.
B. Option Exercise Price is $23.50/lb. U_3O_8
C. Option Term is one year.
D. Option is exercised at the end of the one year term.

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TOPICAL ESSAY

ments with high priced material. An option eliminates the risk of exposure in selling short in a rising market.

To the seller of an option, the advantages are basically two-fold. In the case of a utility with excess inventory, an option can produce revenue from otherwise idle assets. For many utilities this is an attractive prospect, especially as there may be management or regulatory pressure to justify a large inventory. Secondly, by selling an option there is some chance that the seller of the option will have established a market for the material. Given the current nature of the market and the difficulty in selling material, particularly in large quantities, this will be a major driving force in dealing in options.

To quantify the value of an option, Table 3 lays out an example of an expected value calculation for the purchaser of an option. (A similar calculation can be performed for the seller of an option.) For purposes of this example, the option is assumed to have a term of one year at an Option Price of $0.25 lb. U_3O_8 and an Option Exercise Price of $23.50 lb. U_3O_8. Qualitative considerations such as the additional flexibility that a producer may gain from buying an option or the easing of pressure from upper management or the Public Utility Commissions that a utility might get from selling an option are difficult to assess but are additional benefits of an option.

An option not only gives freedom of operational action not available in a straight sale, but flexibility in contractual terms as well. Not only are all the exercise terms negotiable, but the option terms are quite variable also. The major option terms which must be agreed upon are:

1. Option Exercise Price: At what price level will the option to purchase and sell be exercised?

2. The Option Price: What will the purchaser of the option pay the seller in consideration for the option? Is this price credited towards the exercise price in the event that the option is exercised?

3. Term: For how long will the option be effective? Does the buyer have the right to extend the option under similar conditions for additional periods?

4. Prior Sale: Does the seller of the option have the right to sell the material during the Term if the buyer of the option is given a right of first refusal? How long does the buyer have to make this decision? This is an extremely important item, for it will determine whether the seller of the option must take the material out of the market for the Term of the option contract.

Thus the overall attractiveness of an option to both buyer and seller lies in the increased flexibility it permits—flexibility in operations management, inventory handling, and in the conditions under which a sale will take place. Under the uncertain market conditions that currently prevail, it is the need for such flexibility that has sparked interest in unusual transactions such as the option.

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ESSAY

NUCLEAR AGREEMENTS UPDATE

Introduction

The Treaty on the Non-Proliferation of Nuclear Weapons (NPT), entered into force in 1970, was intended to prevent the spread of nuclear weapons by allowing regulated transfer and use of nuclear materials and technology under the scrutiny of the International Atomic Energy Agency (IAEA). In addition to the NPT, several uranium producing nations established nonproliferation policies with conditions even more restrictive than the NPT. An update on the bilateral nuclear agreements of the US, Canada and Australia is included in this essay, along with a look at nuclear policy in those three countries.

US

In the US, the safeguards policy of the Carter Administration resulted in the passage of the Nuclear Non-Proliferation Act (NNPA) in 1978. The NNPA revised US policy regarding safeguards agreements, the exportation of natural and enriched uranium, nuclear equipment and technology and the reprocessing, recycling and retransfer of US uranium and plutonium. Under the act, the US unilaterally claimed broad rights of approval and tight controls on the transfer and reprocessing of US supplied nuclear material. The NNPA set criteria and procedures for negotiating agreements for cooperation (bilateral or multilateral) with other nations to reflect the changes in policy. The act also called for an upgrading of existing agreements to conform to the new standards.

The process of negotiation in the US takes place as follows. The State Department negotiates the bilateral agreements with technical assistance from the Department of Energy and with advice from the Director of the Strategic Arms and Disarmament Agency. The completed document is then sent to the President. The President has comments from the Nuclear Regulatory Commission (NRC) available to him as well. Following Presidential approval, the agreement is transmitted to Congress. Congress has 60 days to overturn the President's decision. Unlike treaties, the agreement does not require ratification. After Congressional review, the two countries formally communicate mutual acceptance. The agreement then enters into force.

In an effort to upgrade existing US agreements, there have been preliminary rounds of renegotiation talks with many countries. Renegotiation talks have been completed and revised agreements entered into force with Australia, Canada and the IAEA.

Since the passage of the NNPA, only one completely new agreement, with Morocco, has been negotiated, signed and entered into force. Negotiations for new agreements with Bangledesh, Peru and Egypt have all been completed and are expected to enter into force this year. An agreement with Bangledesh has been approved by President Reagan and is expected to be signed in Bangledesh soon. The Egyptian agreement was signed by Reagan and is now before Congress for review.

Some of the countries with which renegotiations are well along include Colombia, Indonesia, Norway, Finland and Sweden. Negotiations with Colombia have been completed but the agreement has not yet entered into force. The agreement with Indonesia is in a similar stage. Renegotiation talks have been completed but the agreement has not yet entered into force pending ratification by the Indonesian legislature.

Finalization of a revised agreement with Norway is pending. The agreement is still within the US Executive Branch although the renegotiations have been completed and the text has been initialled. The final revision is expected to go to President Reagan soon. The bilateral agreement with Finland is fairly far along the renegotiation chain although outstanding issues remain.

The existing US agreement with Sweden does not expire until September 1996, however, negotiations to bring it in line with the NNPA are underway. Initial agreement on the text is still pending. The issue of reprocessing is a major stumbling block. It currently is not possible for the US to export uranium to Sweden because Swedish law requires that spent fuel be reprocessed. Under US law, a guarantee to reprocess cannot be provided in advance; rather, each case is handled separately. In light of President Reagan's recent comments on the reprocessing of nuclear fuel, however, discussions with Sweden in particular may be slightly easier than before.

The entire renegotiation process is presently under review within the Reagan Administration although not much effort is being expended currently in that direction. The focus has been on implementation of the Congressional directive to renegotiate. It is still possible that the renegotiation program will be modified or changed in time. However, the first order of business will be the implementation of the recent policy statement.

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ESSAY

On July 16 President Reagan issued a press statement and an accompanying fact sheet on nuclear proliferation. Prior to this issuance, the bilateral negotiators had no new Reagan policy to implement. This major announcement gave basic guidelines reinforcing the "longstanding objectives" of the US in nonproliferation areas. Emphasis was made on dealing with the security aspects of proliferation including working with other nations on "combatting the risks of proliferation." The tying together of proliferation policy with foreign policy adds a new aspect to the US doctrine.

The statement strongly defended continuation and strengthening of both the NPT and the IAEA. Safeguards issues were staunchly supported along with a continuation of efforts towards preventing the "spread of nuclear explosives to additional countries" and inhibiting the "transfer of sensitive nuclear material, equipment and technology."

The US policy on reprocessing was presented in a light that may be received enthusiastically by US nuclear trading partners. President Reagan declared that "the Administration will not inhibit or set back civil reprocessing and breeder reactor development abroad in nations with advanced nuclear power programs where it does not constitute a proliferation risk." An initial step towards regaining outside confidence in the US as a "reliable partner for peaceful nuclear cooperation under adequate safeguards" was taken with Reagan's directive to Executive Branch agencies to expedite export requests where the mandatory statutory requirements have been met.

Overall, the policy set forth seemed to be cognizant of the realities of nuclear power on the international scene. Reprocessing was accepted as a way to dispose of spent fuel rather than as a major proliferation risk, as was the case during the Carter Administration. The foundation of the Carter nonproliferation policy was the link between the spread of civilian nuclear power and the spread of weapons potential. Plans for reprocessing and a breeder reactor program were stopped or curtailed in the US under the assumption that the development of nuclear power programs not only in the US, but internationally, would lead to a "plutonium economy" wherein the availability of nuclear weapons substances would increase and detection of the movement of plutonium into weapons programs would become more difficult.

However, US efforts to stop the spread of reprocessing development were met with hostility and suspicion. Other governments saw the move as a threat to their civilian power programs. In many countries, notably within the ranks of some long-time allies, the result was a drop in confidence in the US commitment to the NPT as well as lowered confidence in continued access to nuclear material and technology. The US had imposed additional safeguards restrictions without any commensurate assurance of supply. In formulating this policy, it was believed that dependence on US technology would force other countries to accept US policy.

In hindsight, the premises of the Carter policy on nonproliferation are questionable. US nuclear technology is no longer necessarily the most advanced in the world. It has been argued that the NNPA eroded the US position in nuclear technology and overseas sales. Politically there has been much international criticism of the NNPA, and confidence in the US as a reliable uranium, enrichment and technological source has weakened. It has become clear that the unilateral approach to nuclear trade decisions did not facilitate international acceptance of nuclear export policies. The Reagan Administration has now indicated a willingness to be less restrictive towards countries where the risk of weapons-use is not viewed as significant.

President Reagan has stressed that his stand on nonproliferation is just as serious as any past commitment has been. His shift in policy emphasis reflects a review of the successes and failures of the past approach and a rethinking of US action. It is now apparent that the US must work within an international forum towards nonproliferation ends if those ends are to be achieved. In the US, the NNPA will possibly be revised to conform with a more realistic view of the international nuclear situation.

Other countries have remarked favorably on the attitude put forth in the Reagan statement on nuclear proliferation. However, the document fails to address some specific questions. The implementation of the policy will be the point on which it is judged. The various approaches to nuclear nonproliferation will continue to be considered in the implementation of US policy and in the plotting of the US course of nuclear participation.

Australia

The Australian government's stand on nonprolifer-

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ation has been a strong one emphasizing prior consent rights over the use and transfer of Australian origin uranium. Last November, the Australian Minister for Foreign Affairs announced that the government had decided to permit reprocessing of Australian origin uranium under certain conditions. The conditions outlined by the Minister included approval of reprocessing in association with power production, storage and use of plutonium in a manner minimizing nuclear proliferation risks, agreement by the end user of continued consultation and review of the reprocessing conditions, and end user commitment to support development of more effective international control measures.

In Australia, bilateral safeguards agreements are in force with the US, Canada, the United Kingdom, Sweden, Finland, the Philippines and Korea. Administrative Arrangements (AA) covering implementation of the agreements, are required under the bilateral agreement structure. Some AA's, including one with the US, are not in place. However, negotiations on the AA's are progressing at a rate so as not to impede the administration of the bilateral agreements already "in place."

Safeguards agreements negotiated but not yet in force exist with France (contingent upon Euratom/IAEA/French trilateral agreement) and Euratom (subject to finalization of AA and individual member states approval). The ratification of the French/European Economic Community (EEC)/IAEA trilateral agreement has been delayed due to the change in the French government.

Negotiations of a safeguards agreement with Japan are proceeding slowly as Japan is unwilling to settle prior to the completion of the Euratom agreement. Japanese negotiators appear to be delaying because they do not wish to settle on any matter of substance without first being convinced that they will not be disadvantaged vis-a-vis Euratom members. The most recent safeguards negotiations between Australian and Japanese officials made substantial progress but failed to resolve various issues.

An Australian safeguards agreement with Switzerland is planned but has not yet been negotiated. Negotiations are also possible in the future with three EEC members; West Germany, Italy and Belgium. The recent trade discussions between Australia and Egypt at ministerial levels may indicate that safeguards negotiations between the countries are possible.

Canada

The strictest Canadian bilaterial agreements, Category I, require the party to be an NPT signator or to have made an equivalent commitment to nonproliferation. Canada has Category I agreements with Finland, Sweden, the EEC, the US, Japan, Korea, the Philippines, Australia and Romania. Under these agreements, Canada can export uranium and nuclear technology and equipment. Bilateral agreements with Spain and Argentina have been negotiated, but cannot be signed until the two countries comply with the safeguards requirements. Arrangements for trade under existing contracts are continuing but no new nuclear-related contracts will be signed until the bilateral agreements are in force.

Canada has completed a negotiated agreement with Switzerland, but it has not yet been signed. The agreement is acceptable to the Canadian government. However, the Swiss federal government does not believe it can impose "strings" on the nuclear programs of the cantons, as would be the case if the agreement were in force.

Negotiations for bilateral agreements with Mexico, Indonesia and Yugoslavia are in early stages. Further along is the agreement between Canada and Euratom. Negotiations began in January 1978 and good progress is reported. It is very possible that the agreement will be completed this year.

As is the case with the US, it is believed by some that Canada's strict safeguards policy has been a hindrance to the country's position in international commercial competition. There is currently an internal review of Canada's nuclear industry by the Energy Mines and Resources Department. However, Canadian policy on safeguards and nonproliferation has been confirmed by the government, and the Energy Minister recently stated that the government does not intend to moderate the safeguards stance despite a reduction of nuclear sales.

Canada's policy on reprocessing has never been one of outright denial. Rather, the policy calls for a "mutual agreement right" over reprocessing. There are guidelines for the implementation of this right with Canada's nuclear partners and this allows more flexibility than similar US agreements. The Canadians may be headed down the same road as the Australians in their agreements with a move away from case-by-case consideration of reprocessing. The alternative is an agreement based on a nuclear program which has been set forth and agreed to in advance by both sides.

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SPANISH NUCLEAR PROGRAM — PART I

Introduction

The Spanish government initiated a multi-phase nuclear power program in the early 1960's. The program was designed to do industry-related research and development, to participate in the construction of nuclear power plants, and to supply nuclear fuel to the utilities. The program was later expanded to include involvement in uranium exploration, exploitation, and enrichment outside of Spain.

Spain's nuclear program is controlled by the Ministry of Industry and Energy. The functionary agencies include the state owned Junta de Energia Nuclear (JEN) which was formed in the 1950's for the purpose of prospecting and exploring for uranium inside Spain, and Empresa Nacional del Uranio S.A. (ENUSA) which is controlled 60 percent by the state-owned holding company Institute Nacional de Industria (INI) and 40 percent by seven private utilities. ENUSA was created to develop a total fuel cycle for Spain. The company's responsibilities include uranium exploration, all mining and milling, conversion, enrichment, fuel fabrication and spent fuel treatment in Spain. In addition, ENUSA actively participates in uranium ventures and/or procurement outside of Spain. ENUSA procures the fuel for all Spanish reactors in operation, under construction, and in the planning stage.

The production of nuclear power in Spain began in the late 1960's. By late 1972, three nuclear power plants were operating at a combined capacity of 1100 MWe. Construction of seven additional plants with a capacity of 6555 MWe was well underway by 1976. The first of the seven plants, Almaraz I, with a capacity of 930 MWe, began producing electricity in late June, 1981. The second plant, Asco I, is scheduled for startup in late 1982. The remaining five plants, plus two larger plants having a combined capacity of 2005 MWe but not yet under construction, are scheduled to be operational by the 1986-88 period. The nuclear generating capacity for Spain will total 9660 MWe at that time if the present construction schedule is maintained. Figure 1 shows the location and status of nuclear power plants throughout Spain.

Fuel Supply Schedule

ENUSA has acquired fuel for the present Spanish requirements based on a schedule of about 12,000 tonnes U_3O_8 cumulative through 1987. Domestic supply capability has been about 200 tonnes U_3O_8 annually. ENUSA has entered into long-term purchase agreements to receive the remainder of its requirements from Canada, Niger, South Africa and Namibia. Enrichment services have been, and will continue to be, supplied in part by France, England, Russia and the US.

Spain's 1980 production of 200 tonnes U_3O_8 was obtained from two different mine and mill operations. About 130 tonnes per year were produced from the Mina FE mine at Ciudad Rodrigo in the province of Salamanca. The remaining 70 tonnes U_3O_8 were produced from the Mina El Pedregal at Don Benito, Badajoz Province. The production facility at Ciudad Rodrigo is scheduled for expansion to 600 tonnes U_3O_8 annually by 1985-86. In addition, ENUSA plans to produce another 100 tonnes U_3O_8 annually as a by-product to phosphate production by 1984-85. ENUSA estimates that domestic production of U_3O_8 will total at least 800 tonnes per year by the 1985-86 period and will make a substantial contribution to the then annual requirements estimated to be 2500 tonnes U_3O_8.

ENUSA has taken added precaution to insure long term uranium supplies for Spain through participation in several foreign uranium projects. ENUSA has a ten percent stake in the Compagnie Miniere d'Akouta (COMINAK) in Niger which began producing uranium concentrates in 1978. ENUSA also acquired a 12.5 percent participating interest in the Conwest Canadian Uranium Exploration Joint Venture in Saskatchewan and Quebec in 1975. The company has a 25 percent interest in an exploration joint venture in the Karoo district in South Africa and has a 49 percent interest in a joint venture with the Colombian Institute de Asuntos Nucleares (IAN) which conducts exploration activities in Colombia. In addition, ENUSA holds an 11.1 percent interest in Eurodif, a joint venture for uranium enrichment located in France. ENUSA supplies U_3O_8 to Eurodif for enrichment services.

Uranium Resources

Exploration for uranium resources in Spain began about 1950. JEN began regional reconnaissance operations in the continental sediments of the interior regions, and in the igneous and metamorphic rocks of the mountainous areas. Approximately 40 prospective radiometric anomalies and mineral occurrences were located and JEN selected the most favorable for further

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RAW MATERIALS

PLANT STATUS

OPERATING
1. ZORITA 160 MWe
2. GARONA 460 MWe
3. VANDELLOS I 480 MWe
4. ALMARAZ I 930 MWe

UNDER CONSTRUCTION
5. ALMARAZ II 930 MWe
6. LEMONIZ I 930 MWe
7. ASCO I 930 MWe
8. LEMONIZ II 930 MWe
9. ASCO II 930 MWe
10. CONFRENTES 975 MWe

PLANNED 1986 to 1995 PERIOD
11. TRILLO I 1030 MWe
12. VALDECABALLEROS I 930 MWe
13. VANDELLOS II 930 MWe
14. SAYAGO 1070 MWe
15. REGODOLA 1100 MWe
16. TRILLO II 1000 MWe
17. VANDELLOS III 1000 MWe
18. VALDECABALLEROS II 975 MWe

Figure 1
LOCATION AND STATUS OF NUCLEAR POWER PLANTS IN SPAIN

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appraisal. Important uranium mineralization was subsequently discovered in at least three separate districts. JEN continued exploration and, in addition, developed the technology for treatment of the uranium ores.

The properties were transferred to ENUSA for exploitation in 1973 at which time evaluated reserves (designated by JEN) were estimated at 5000 tonnes U_3O_8 at an ore grade of 0.10 percent. The exploration activities are ongoing and ENUSA has recently estimated evaluated reserves for the three deposits as listed in Table 4.

Table 4

URANIUM RESERVES OF SPAIN

Mine	Province	Tonnes U_3O_8
Mazarete	Guadalajara	2,000
Mina El Pedregal	Badajoz	800
Mina FE	Salamanca	15,500
Total evaluated Reserves*		18,300

*Equivalent to reasonably assured resources recoverable at a forward cost of $35.00 lb U_3O_8.

The uranium reserves of Mina FE and other mines at Ciudad Rodrigo represent about 82 percent of total Spanish evaluated reserves. This district has been the focus of most exploration completed to date. ENUSA plans to increase exploration and mine development in the area to meet the proposed production schedule. Exploration in other potential areas may be increased also. As of July 1, JEN assigned all prospecting and exploration duties to ENUSA, including an assignment to explore about 100,000 square kilometers of sedimentary rocks in central Spain. The task to explore the sediments was originally assigned to Plan Nacional de Exploracion de Uranio (PNEU) in 1971. Work on the project may be intensified under ENUSA.

Several foreign groups are in direct competition with ENUSA for exploration areas. The US companies Exxon Corp. and Chevron Exploration Corp. and England's British Petroleum Ltd. have been active in Spain for several years. If they are successful in their exploration efforts, the resulting uranium would first be offered to ENUSA for purchase at the world market price at time of production. The status of each foreign program is uncertain at this time. However, it is reported that each company has experienced only moderate success.

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STATISTICAL DATA

EXCHANGE VALUE $23.50/lb. U_3O_8
Determined as of July 31, 1981

Definition

The Exchange Value is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month.

Derivation

Nuexco bases the Exchange Value upon:

A. Data from recently completed transactions.

B. Data from pending transactions.

C. Firm bids to buy and firm offers to sell.

D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Exchange Value:

A. The price of uranium delivered or to be delivered under old contracts.

B. The price of uranium delivered in connection with contract renegotiations or other than arm's length transactions.

TRANSACTION VALUE
Determined as of July 31, 1981

$/lb U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
24.40	2.9	10	5

Definition

The Transaction Value is a weighted average price of recent transactions, and is based on prices paid for U_3O_8 in transactions closed within the previous three-month period and for which delivery was scheduled within one year of the transaction date. At least ten transactions totaling at least two million pounds U_3O_8 are included in each calculation, or the sample time is extended as necessary to include these minima. Foreign currencies are converted to US dollars as of the transaction date.

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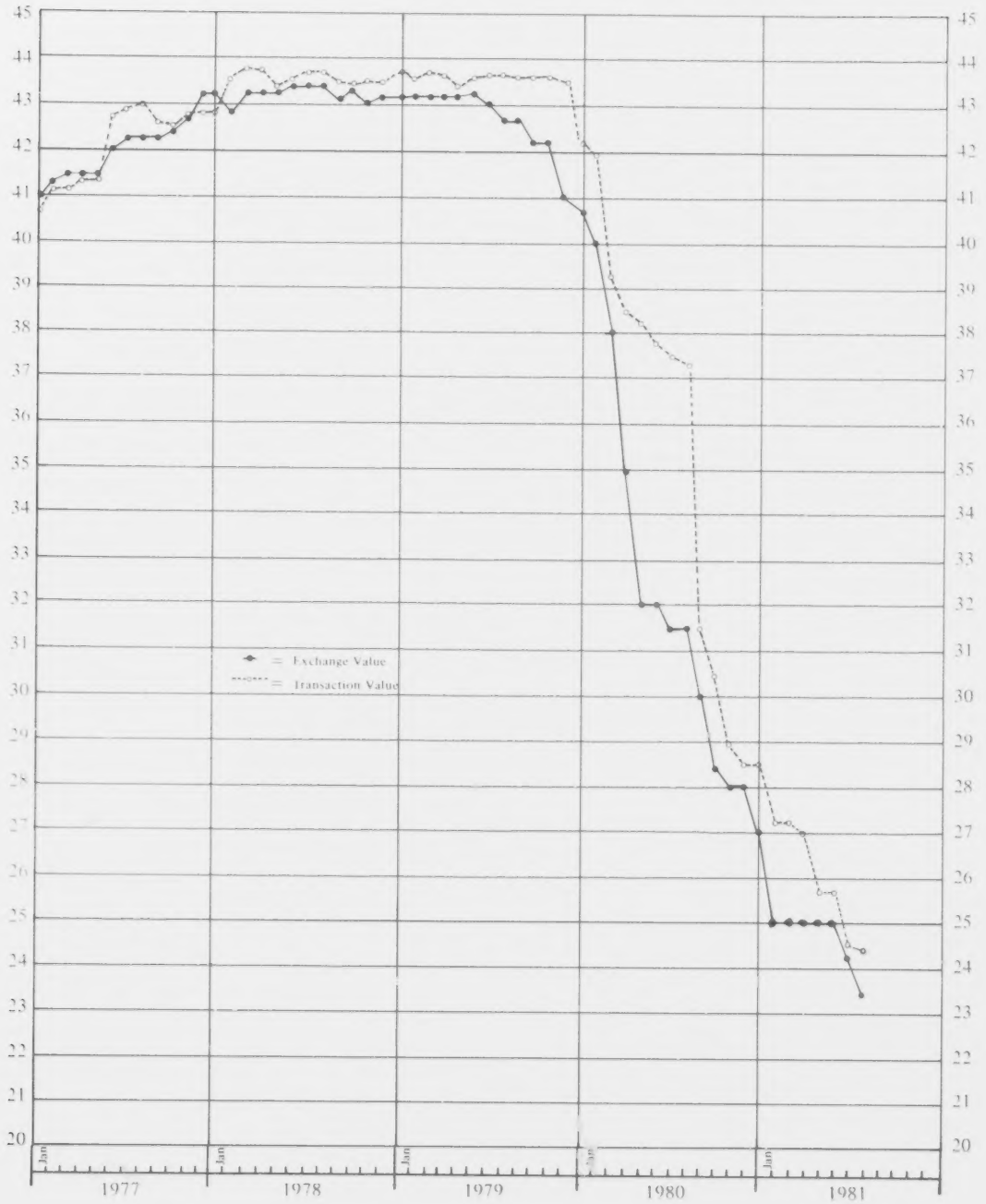
STATISTICAL DATA

EXCHANGE AND TRANSACTION VALUES SINCE JANUARY 1977

Determined as of the last day of the month indicated



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STATISTICAL DATA

HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	–	–	–	–	–	–	–	6.35	6.35	6.40	6.45	6.50
1969	–	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50					

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	–	–	–	–	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40					

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES*

Country	per lb U_3O_8 in Concentrates	per kg U_3O_8 in Concentrates	per kg U in Concentrates
US (dollar)	23.50	51.81	61.09
France (franc)	136.87	301.74	355.82
FRG (mark)	57.71	127.23	150.04
Japan (yen)	5,614	12,377	14,595
Switzerland (franc)	50.09	110.42	130.21
UK (pound)	12.64	27.87	32.86
Australia (dollar)	20.67	45.56	53.73
Canada (dollar)	28.76	63.41	74.77
Niger, Gabon (CFA)	6,843	15,087	17,791
South Africa (rand)	22.15	48.83	57.58
Sweden (kröner)	122.52	270.12	318.53

*Calculated using currency exchange rates published in the Wall Street Journal on the last business day of the month.

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STATISTICAL DATA

CONVERSION VALUE $1.15/lb. U as UF_6
Determined as of July 31, 1981

Definition

The Conversion Value is Nuexco's judgment of the price at which spot and or near term transactions for significant quantities of conversion services could be concluded in the secondary market as of the last day of the month.

Derivation

Nuexco bases the Conversion Value upon:

A. Data from recently completed transactions.

B. Data from pending transactions.

C. Firm bids to buy and firm offers to sell.

D. Prices purchasers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy, and prices sellers have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell.

Comments

Nuexco does not consider the following in determining the Conversion Value:

A. The price of conversion services delivered or to be delivered under old contracts.

B. The price of conversion services delivered in connection with contract renegotiations or other than arm's length transactions.

LOAN USE CHARGE RATE 5-1/2%
Determined as of July 31, 1981

Definition

The Loan Use Charge Rate is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the last day of the month.

Derivation

Nuexco bases the Loan Use Charge Rate upon:

A. Data from recently completed or pending loan transactions.

B. Rates included in firm proposals to borrow or lend.

C. Rates that potential borrowers and lenders have expressed as a willingness to pay or accept, but for which Nuexco is not aware of firm proposals.

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STATISTICAL DATA

CURRENT TRANSACTIONS*

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as percent of Current E.V.	Seller Group	Buyer Group	Remarks
Uranium Transactions						
1583	1981	101–300	–	US	Far East	See text
1584	1981	301–600	–	US	Far East	See text
1586	1981	101–300	99	US	US	

Nuexco Reference Number	Delivery Period	Approximate Quantity (thousands of pounds, U equivalent)	Approximate Price as percent of Current C.V.	Seller Group	Buyer Group	Remarks
Conversion Transactions						
1567	1983–85	1,001–2,000	104	US	US	
1585	1981	301–600	90	US	non–US	

*Transactions listed include not only those in which Nuexco was involved, but also all others of which Nuexco is aware.

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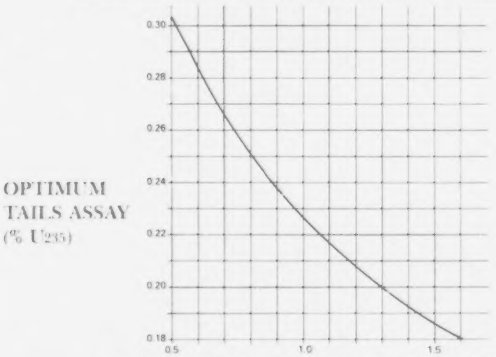
STATISTICAL DATA

OPTIMUM TAILS ASSAY

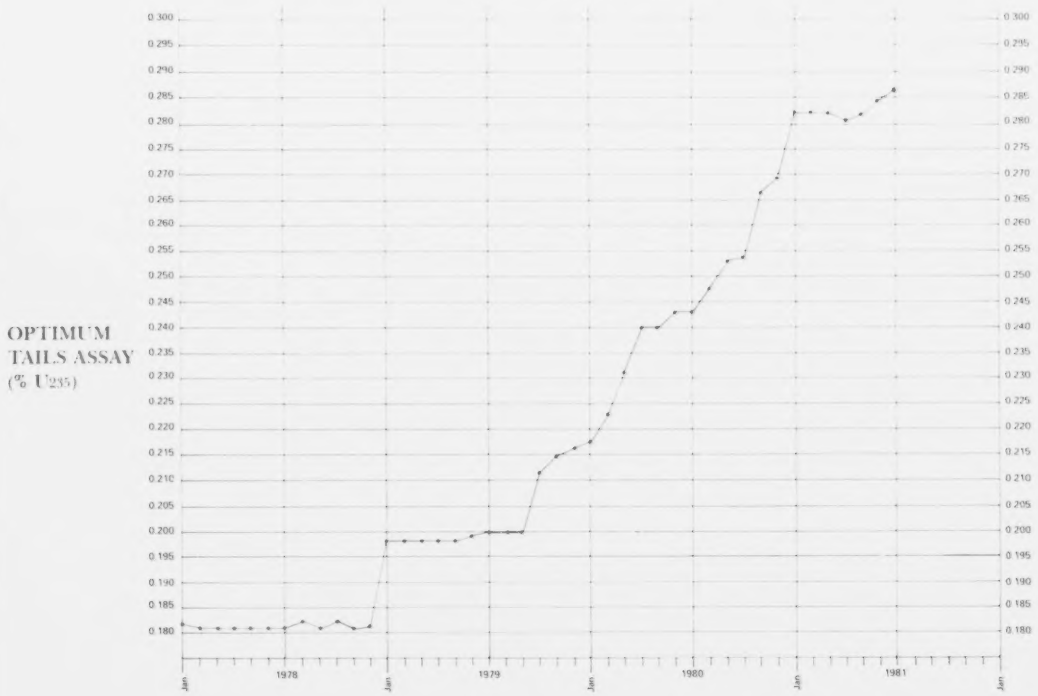
The optimum tails assay is the tails composition at which the cost of enriched uranium is lowest for given costs of separative work (SWU) and natural uranium feed. It depends only on the ratio of the cost of a kilogram of natural uranium in the form of UF_6 to the cost of a kilogram unit of separative work. The US Department of Energy (USDOE) Adjustable Fixed Commitment (AFC) enrichment contract holders have the option, within limits, to specify the transaction tails assay. The transaction tails assay for USDOE Requirements contracts is 0.2 percent U_{235}. For every one-hundredth of one percent increase in the transaction tails assay, uranium consumption increases about two percent.

TAILS ASSAY FOR MINIMUM COST OF PRODUCT*



*From Nuexco Report 138

OPTIMUM TAILS ASSAY†



†Based on Exchange Value and USDOE AFC SWU price; interpolated to the nearest thousandth.

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STATISTICAL DATA

US GOVERNMENT STATISTICS

	Producer Price Index—Industrial Commodities (1967 = 100)[1]	Consumer Price Index (1967 = 100)[2]	GNP Implicit Price Deflator (1972 = 100)[3]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
				Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
Ann. Avg. 1970[5][7]	110.0	116.3	91.36	3.88	3.87	3.69	3.28
Ann. Avg. 1971[5][7]	114.1	121.3	96.02	4.12	4.15	3.97	3.49
Ann. Avg. 1972[5][7]	117.9	125.3	100.00	4.56	4.59	4.26	3.71
Ann. Avg. 1973[5][7]	125.9	133.1	105.80	4.84	4.98	4.51	3.91
Ann. Avg. 1974[5][7]	153.8	147.7	116.02	5.44	5.63	4.88	4.21
Ann. Avg. 1975[5][7]	171.5	161.2	127.15	6.13	6.24	5.39	4.64
Ann. Avg. 1976[5][7]	182.4	170.5	133.71	6.76	6.87	5.91	4.96
Ann. Avg. 1977[5][6][7]	195.1	181.5	141.70	7.28	7.67	6.43	5.39
Ann. Avg. 1978[5][6][7]	209.4	195.4	152.05	8.23	8.56	7.02	5.82
Ann. Avg. 1979[6][7]	236.5	217.4	165.46	9.27	9.49	7.60	6.32
Ann. Avg. 1980	274.5	246.8	177.36	10.26	10.61	8.29	6.96
Mar 1980	268.6	239.8	174.48	9.90	10.22	8.05	6.78
Apr 1980	271.3	242.5	–	10.00	10.30	8.12	6.79
May 1980	271.9	244.9	–	10.18	10.37	8.17	6.78
Jun 1980	273.5	247.6	178.93	10.13	10.69	8.24	6.87
Jul 1980	276.2	247.8	–	10.24	10.82	8.35	6.96
Aug 1980	278.2	249.4	–	10.38	10.78	8.39	7.02
Sep 1980	278.8	251.7	182.92	10.54	10.94	8.46	7.14
Oct 1980	282.2	253.9	–	10.58	11.00	8.52	7.20
Nov 1980	283.4	256.2	–	10.73	11.06	8.59	7.29
Dec 1980	286.6	258.4	183.98	10.86	11.31	8.68	7.39
Jan 1981	291.5R	260.5	–	10.91R	11.31R	8.74R	7.41R
Feb 1981	295.7R	263.2	–	11.15R	11.36R	8.80R	7.43R
Mar 1981	298.9	265.1	188.14R	11.13R	11.50R	8.84	7.47R
Apr 1981	302.8	266.8	–	11.30	11.63	8.94	7.51
May 1981	304.1	269.0	–	11.25P	11.71P	8.95P	7.55P
Jun 1981	304.7P	271.3P	190.91P	–	–	9.05P	7.56P

P = Preliminary R = Revised since last month

(1) US Bureau of Labor Statistics, Washington, D.C.; "Producer Prices and Price Indexes," Table 6 (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

(2) US Bureau of Labor Statistics, Washington, D.C.; Consumer Price Index for All Urban Consumers, US City Average, All Items.

(3) US Department of Commerce, Washington, D.C.; Bureau of Economic Analysis, National Income and Wealth Division; "Survey of Current Business," Table A. The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

(4) US Bureau of Labor Statistics, Washington, D.C.; "Employment and Earnings," Table C-2. All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for January 1977 and beyond are adjusted to the March 1979 benchmark.

(5) Monthly data 1970-1978 for Price Indexes and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNP Implicit Price Deflator appear on pages 4.6-4.8 of Nuexco Report 139.

(6) Monthly data 1977-1979 for Employment and Earnings SIC codes 10, 333, and 28 appear on page 33 of Nuexco Report 147.

(7) Monthly data 1970-1979 for Employment and Earnings SIC code 36 appear on page 23 of Nuexco Report 154.

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STATISTICAL DATA

AUSTRALIAN GOVERNMENT STATISTICS

	Price Index of Materials Used in Manufacturing Industry—All Groups (Year 1968-69 = 100.0)[1]	Weighted Average Minimum Weekly Wage Rates—Adult Males Australia Mining and Quarrying (A$)[2]
Annual Avg. 1970 (3)	101.4	59.88
Annual Avg. 1971 (3)	101.5	65.95
Annual Avg. 1972 (3)	105.6	71.26
Annual Avg. 1973 (3)	124.4	78.96
Annual Avg. 1974 (3)	141.9	108.07
Annual Avg. 1975 (3)	150.4	132.55
Annual Avg. 1976 (3)	168.4	160.93
Annual Avg. 1977 (3)	192.0	179.03
Annual Avg. 1978 (3)	198.5	190.04
Annual Avg. 1979	248.8	196.34
Annual Avg. 1980	321.8R	217.88R
Mar 1980	340.3	214.83
Apr 1980	328.4R	215.14R
May 1980	335.6R	214.81
Jun 1980	338.8R	214.14
Jul 1980	347.8R	221.44
Aug 1980	352.0R	219.95
Sep 1980	350.3R	219.45
Oct 1980	348.2R	220.93R
Nov 1980	350.4R	221.31R
Dec 1980	351.7R	221.63R
Jan 1981	357.8R	228.51R
Feb 1981	356.6R	228.33R
Mar 1981	355.2R	227.56R
Apr 1981	354.6	227.26
May 1981	353.3P	235.12P

P = Preliminary R = Revised since last month

(1) Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6111.0), Table 3.
(2) Australian Bureau of Statistics, Canberra: "Wage Rates, Australia" (Catalogue No. 6312.0), Table 1. Figures for the latest fourteen months shown are subject to revision.
(3) Monthly data for 1970 through 1978 appear on pages 4.7 and 4.8 of Nuexco Report 138.

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STATISTICAL DATA

CANADIAN GOVERNMENT STATISTICS

	Industry Selling Price Index: Manufacturing (D 500000)[1,2] (1971 = 100.0)	Wage-earner Data: Average Hourly Earnings (C$)[3,4]		
		Metal Mining, including milling (SIC 050-059)	Primary Metal Industries, non-ferrous (SIC 296-298)	Chemicals and Chemical Products (SIC 370-379)
Annual Avg. 1977	174.3	8.18	6.50	6.51
Annual Avg. 1978	190.4	8.76	6.82	6.97
Annual Avg. 1979	217.9	9.60	7.35	7.67
Annual Avg. 1980	247.2R	10.59	8.05	8.50
Mar 1980	239.5	10.34	7.83	8.26
Apr 1980	241.1	10.40	7.94	8.36
May 1980	242.4	10.50	8.01	8.44
Jun 1980	243.7	10.51	8.07	8.46
Jul 1980	246.3	10.49	8.11	8.55
Aug 1980	249.4	10.58	8.14	8.65
Sep 1980	252.0	10.85	8.24	8.71
Oct 1980	256.0	11.05	8.28	8.82
Nov 1980	257.7	11.11	8.38	8.77
Dec 1980	258.4	11.13	8.32	8.92
Jan 1981	263.3R	11.27	8.51	8.90
Feb 1981	263.6R	11.43	8.59	9.00
Mar 1981	265.4R	11.47P	8.63P	9.17P
Apr 1981	267.7	11.72P	8.76P	9.34P
May 1981	269.6P	—	—	—
Jun 1981	271.9P	—	—	—

P = Preliminary R = Revised since last month

(1) Statistics Canada, Prices Division, Ottawa; "Industry Price Indexes" (Catalogue 62-011), Table 1. Indexes for the most recent six months shown are subject to revision.
(2) Monthly data for 1973 through 1978 appear on page 4.10 of Nuexco Report 138.
(3) Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa; "Employment, Earnings and Hours" (Catalogue 72-002), Table 2.
(4) Monthly data for 1977 and 1978 appear on page 4.11 of Nuexco Report 138.

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STATISTICAL DATA

REPUBLIC OF SOUTH AFRICA STATISTICS

	Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Consumer Price Index[2] (1975 = 100, except where otherwise indicated)	Wholesale Price Index All Groups (1975 = 100)
Annual Avg. 1970[3]	7.34	100.3[4]	
Annual Avg. 1971[3]	7.88	106.4[4]	59.1
Annual Avg. 1972[3]	8.79	113.3[4]	63.9
Annual Avg. 1973[3]	10.51	124.1[4]	72.3
Annual Avg. 1974[3]	13.18	138.5[4]	85.3
Annual Avg. 1975[3]	16.71	157.2[4]	100.0
Annual Avg. 1976[3]	19.30	174.7[4]	115.1
Annual Avg. 1977[3]	23.87	194.4[4]	130.0
Annual Avg. 1978[3]	27.14	137.2	142.7
Annual Avg. 1979[3]	30.18	155.3	164.5
Annual Avg. 1980	35.53	176.7	192.1
Mar 1980	33.65	168.0	181.7
Apr 1980	–	170.0	184.2
May 1980	–	171.9	187.0
Jun 1980	34.48	174.6	189.0
Jul 1980	–	177.2	192.7
Aug 1980	–	179.2	196.8
Sep 1980	36.19	182.8	199.8
Oct 1980	–	186.3	203.1
Nov 1980	–	187.8	205.6
Dec 1980	37.69	189.9	206.5
Jan 1981	–	191.0	207.2
Feb 1981	–	193.8	209.8
Mar 1981	39.26	195.2	209.9
Apr 1981	–	196.4	211.6
May 1981	–	197.7	213.2
Jun	–	200.0	–

(1) Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly.
(2) Republic of South Africa Department of Statistics, Pretoria: "Government Gazette: Consumer Price Index for Urban Areas."
(3) Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Nuexco Report 140.
(4) April 1970 = 100.00.

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MARKET OPPORTUNITIES

Market Opportunities are *active* inquiries in the uranium market to buy, sell, borrow or lend. The data presented in this section are in no way intended to be indicative of the entire uranium market for the time period covered.

URANIUM SUPPLY

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U_3O_8) 0 to 1 Year	1 to 2 Years	2 to 3 Years	Remarks
Available for Sale:				
1393			350	
1475	1000			UF_6
1480	200	300	300	
1490	1000			UF_6
1540	300	750		UF_6
1550	600			
1552	200			
1562			150	Long term
1575			500	Long term
1581	100	150	150	Long term
1595	600	600	800	
1600			200	Long term
1610		100		
1637	500	500		
1678		275		
1685	100			
1698	100			
1707	100			
1719	30			
1727	500			
1730	30			
TOTAL	5360	2675	2450	
Available for Loan:				
1429	300			UF_6
1602	400			
1646	275	275	275	
1695	225	325	325	UF_6
TOTAL	1200	600	600	

***Measured from the date of this Report.**

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MARKET OPPORTUNITIES

Market Opportunities are *active* inquiries in the uranium market to buy, sell, borrow or lend. The data presented in this section are in no way intended to be indicative of the entire uranium market for the time period covered.

URANIUM DEMAND

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U_3O_8) 0 to 1 Year	1 to 2 Years	2 to 3 Years	Remarks
Inquiries to Purchase:				
1459			200	Long term
1462			100	Long term
1603		100	100	Long term
1634	400	400		
1650	200			
1704		200	200	Long term
1724	500	500	500	Long term
1731	250			
1732	50			
TOTAL	1400	1200	1100	
Inquiries to Borrow:				
1621	300			
1699	250	650		
TOTAL	550	650		

*Measured from the date of this Report.

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MARKET OPPORTUNITIES

Market Opportunities are *active* inquiries in the secondary market for UF_6 conversion services. The data presented in this section are in no way intended to be indicative of the entire market for the time period covered.

CONVERSION SUPPLY

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U as UF_6) 0 to 1 Year	1 to 2 Years	2 to 3 Years	Remarks
1451	75			
1475	700			
1607	1000			
1609	500	1500	1000	Long term
1619		200	100	
1661		400	400	Long term
TOTAL	2275	2100	1500	

CONVERSION DEMAND

Nuexco Reference Number	Delivery Period* (Thousands of Pounds U as UF_6) 0 to 1 Year	1 to 2 Years	2 to 3 Years	Remarks
1594		400	950	Long term
1622		400	400	Long term
1626	75			
1688	500			
1689		300	300	Long term
1722	450			
TOTAL	1025	1100	1650	

***Measured from the date of this Report.**

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